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GAS JOURNAL

LIGHT ♦ HEAT ♦ POWER ♦ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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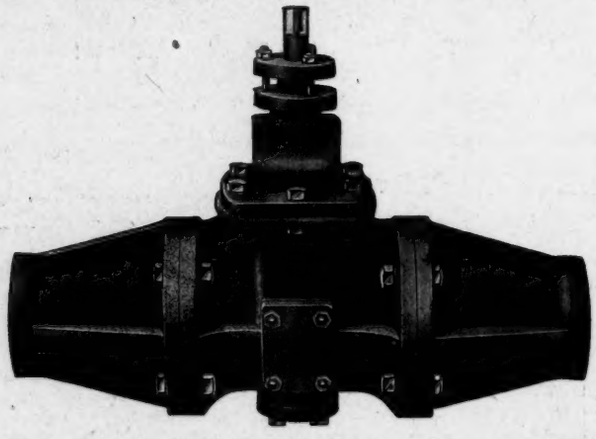

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXXXVIII., No. 2819.] TUESDAY, MAY 22, 1917. [69TH YEAR.

EDITORIAL NOTES.

Fixed Calorific Standard and Future Developments.

THE question of economizing gas coal and distributing a mixture of coal gas and blue water gas has raised a further point which has special application to Welsh gas undertakings and those deriving bituminous coal from that area. All such undertakings have a very real grievance; and they require consideration and guidance in regard to it—in respect of the current and the prospective position, which latter we believe will be such as few ever thought possible a few years—nay months—ago. The matter was raised by Mr. R. G. Clarry at the meeting of the Welsh Association last Wednesday; and it evoked one of the best discussions of the day. It is notorious that Welsh bituminous coal is not such a good gas producer as the coal of the Northern and Midland counties; and the point Mr. Clarry made is that it is impossible for the Welsh undertakings to substantially economize in coal (though there is plenty of incentive in the 6s. 6d. per ton standard excess price) by utilizing blue water gas, if tied to a calorific standard of 500 B.Th.U. The resolution that was passed asked the National Gas Council to give due consideration and allowance to South Wales in comparing results or dealing with any general instructions to be issued to the gas industry—more particularly in reference to the calorific standard and the suggested use of blue water gas to reduce the consumption of coal.

The gas undertakings drawing their supplies from the Welsh pits are justified in asking this, because we are not dealing now with a temporary wartime measure only, but with something that, there are strong indications, may become permanent in the economic development of the gas industry and in generally promoting national fuel economy. At present, any failure to maintain the standard through complying with the requirements of the Ministry of Munitions is already covered by the relief given from forfeiture or other penal consequences; and any deficiency arising from any instruction of the Coal Controller would not, in the circumstances, be accompanied by a penalty for default, seeing that his authority is under the Defence of the Realm Acts. It is, however, in this connection that the gas undertakings obtaining coal supplies from Wales have a grievance in excess of others. They start handicapped by the lower calorific power of the gas from the local coal, given equal makes. In serving the Ministry of Munitions, naturally the calorific power of the gas is somewhat diminished; and, of course, to add a percentage of blue water gas of 300 to 310 B.Th.U. per cubic foot would, assuming the make of coal gas was maintained, cause a further reduction. But there must be regulation of the production of coal gas per ton. Mr. Clarry says that at Swansea experiments are proceeding, which appear to indicate that they will not be able to add more than about 5 p.ct. of blue water gas, if the standard of calorific value is to be maintained. We do not know that (though the results of the experiments will be valuable in the information afforded) there is much necessity for specially working at the present time to maintain the standard, if consumers are given a constant quality of gas at a fair pressure, and free of avoidable inert constituents. There is more in these conditions to the advantage of the consumer than is usually recognized; and we feel that the development of the industry, and the distribution of a gas of good combustible quality at as low a price as possible, point to a compromise between high and low temperature carbonization—a temperature not so low perhaps as is employed in what are known as the "low-temperature" systems, but (according to the character of the coal) one which will give a richer gas than now, which will carry a good percentage of blue-water gas, and give a high flame temperature—the lower carbonizing temperature at the same time reducing the charges for repairs and maintenance of retort-settings. The minimum of incombustibles is as important in the gas consumer's results as, and perhaps more so than, the calorific power.

But the Welsh gas undertakings do not ask for any preferential consideration that is extravagant, or out of keeping with their coal supply. We have fought against the uniformity of the numerical condition in the calorific standard, unless a standard low enough to cover the conditions of all coal supplies, and the highest economy for the consumers, be adopted. At one time we were led to believe, by the concessions made in the Porthcawl and Bedwas and Machen Acts, that a 12 p.ct. margin was going to be allowed from the old 540 B.Th.U. standard in the case of the Welsh coal-using gas undertakings. But this was not so. The parliamentary authorities would not continue the concession which put the penal-line at 475 B.Th.U. They fixed their minds on a universal 500 B.Th.U.; and the Board of Trade has followed them. This is one of the penalties of legislation without scientific knowledge. The parliamentary authorities cannot be expected to know everything—for instance, the factors affecting flame temperature. And the gas industry itself cannot be altogether excluded from a charge of muddling; for there can be no gainsaying that it has been in the habit of feeding our legislators with the teachings of its own empiricism, and not the teachings of scientific investigation. But we have come to the cross-roads from which this must be changed if the industry is to do the best possible for the country, and the country for the industry.

> **There's a divinity that shapes our ends,**
> **Rough-hew them how we will.**

Hackneyed, but very applicable. All through, the legislation affecting the gas industry has been rough-hewn. But now scientific knowledge and national economy should give us greater liberty to progress in larger service. There are men now in collaboration with the Government and Government Departments who understand these things. They are the channels through which the mistakes of the parliamentary past can be proved and, we hope, undone. There is, among others, the Chairman of the Board of Fuel Research (Sir George Beilby, F.R.S.). It was only recently that he was saying at the Society of Arts: "I feel that "while gas consumption will go on and still largely in- "crease, it will be necessary that we should have a larger "production of cheap and, if necessary, poorer fuel gas." This is an emphatic declaration which cannot be complied with under the stunting influence of the inflexible parliamentary treatment of the industry. Though the Coal Controller's Department has not been long in existence, though the Ministry of Munitions is a product of the war, and the same with British Dyes Limited, each and all of these could tell the parliamentary authorities that to hinder the gas industry from rendering to the country its maximum service is a deplorable error, and that they can see no reason why a gas mixture of lower calorific power should not be supplied, providing it is kept at a fairly uniform composition, and that composition including the minimum possible of incombustibles—with all gas appliances fitted with air-regulating devices. We are looking for important developments; but the gas industry must certainly not neglect its opportunity.

Coal Economy in Relation to Lighting and Power.

Some time ago an ingenious individual suggested to the Board of Trade (who grasped the idea with an avidity that indicated the sterility of the bureaucratic land in the production of really useful plans) that artificial lighting should be cut-down by 10 p.ct. so as to save the coal used in the provision of this quantity of light. This was after there had been excision of the large waste of light by shops, public houses, and cinema theatres that indulged in bulk illumination such as a savage would delight in; it was in the days of the old *régime* at the Board of Trade; and it was before the Coal Controller had come upon the scene. The request simply could not be complied with. There was no room for it, in view of what had already been effected by regulation; and, so far as gas was concerned, there was no practicable method of gauging a 10 p.ct. reduction. Now things are done much better. It is found that what further coal saving can be brought about through lighting can only be by change in habits and regulation. Witnesses of this are the Summer Time Act, the shop-hours closing order, and the restriction of the hours of business in licensed premises—all of which have produced economy in lighting, and so a saving of the coal that would have been otherwise required. Since then there has been relaxation. The Coal Controller is urging a general economy in coal; but the Summer Time Act has already pushed further away the prohibited hour for exposed lights. The old wasters of artificial light are again at their favourite game. Long before it is dark, illumination is seen in its old meretricious and vulgar fullness outside some shops and places of entertainment. Only one night last week, passing through Brixton before it was dark, but after the shops were closed, "Electric Avenue" was to be seen with its strings of flame arcs all alight—to no useful purpose. Yet the country is bubbling over with precepts as to economy, and the Coal Controller is pleading for the saving of coal! Nothing but strict prohibition will meet such cases.

The subject of "Economies in Lighting in Relation to "Fuel Saving" was under discussion at the meeting of the Illuminating Engineering Society last Tuesday. It was interesting, as it showed that the scope for coal-saving through lighting is limited, seeing that the quantity of coal used to produce the illuminating agents is relatively small, and that it is only where there is over-indulgence in illumination—that is to say, anything beyond what is required by utility, convenience, and safety—that there is room for curtailment. Some electrical people, with whom commercial considerations override scientific and economical application, do not particularly care for the matter being examined from this point of view, as the facility for excess (apart from high cost) is greater with electricity than with any other form of lighting, and lighting units are the most profitable branch of the business. Still the view of Mr. Leon Gaster, who opened the discussion, and those who took part in it (being advocates of rational lighting), is that whatever can be done as a wartime measure in helping to conserve coal should be done; and Mr. Gaster suggested the appointment of a Joint Committee to consider the matter and make recommendations. Whether the authorities will consider there is enough of material value in it for them to take up the matter is open to doubt; but if the Society likes to appoint an investigating committee of its own who will make recommendations, probably these would have respectful consideration in the right quarter. Anyway, there is no harm in trying. The point is whether anything can be done to economize coal expended for lighting purposes beyond what is obvious—that is, by the suppression of useless excess lighting, or, as it was called in the discussion, luxurious and spectacular lighting. If not, then a Committee might just as well more profitably utilize its time. One of the interesting features of the argument of Mr. Gaster and of others who took part in the discussion was as to the smallness of the scope for anything additional being accomplished of an effectual character so far as lighting goes. It was further thought that it would be better for the authorities to proceed by educational work, rather than regulation, in the attempt to effect whatever remnant of lighting economy is possible. We repeat that nothing but regulation or else prohibition is going to put an end to excess, and convert those of extravagant ways into contributors to the nation's increasing prosperity through economy.

When considering this question, it is advisable to get the premises right, and into proper focus. As an argument in favour of reducing the expenditure of coal, Mr. Gaster pointed out that, whereas 287 million tons of coal were during 1913 raised from our pits, last year the output had dropped to 256 millions. Therefore, the need for economy. The decline in production at this time is due entirely to the circumstances of the war. Perhaps Mr. Gaster does not know that 1913 was a record year for coal exports following the great coal strike of 1912, and that the shipments of coal last year were only about one-half of those in 1913. Deducting exports and bunkers from the output in 1913, there was available for home use 189,073,000 tons; while last year the quantity so available was 200,845,000 tons. These figures tell a very different tale and a more striking one than those submitted by Mr. Gaster. The present need for economy is primarily due to difficulties of transport, and not to output, though fuel economy and the proper use of our coal is a large question that applies not only to now but to the future, inasmuch as we cannot continue to eat into our coal resources at the rate that is being done without serious prospective detriment to the country. The deceptiveness of statistics and estimates, without taking into consideration every aspect of them, is also shown by the computations made as to coal consumption for lighting purposes. It is known that the gas industry carbonizes about 18 million tons of coal per annum; and it is calculated that the electrical industry sends to complete destruction for steam-raising purposes some 4 million tons per annum. Mr. Faraday Proctor, the Electrical Engineer of Bristol, assumes that 23 p.ct. of the electricity output is for lighting; and that 25 p.ct. of the coal used in gas-works is also for the purpose of supplying gas for lighting. Thus 1 million tons for the electricity industry and 4½ millions for the gas industry—say, in round figures, 6 million tons together—represent the coal used for lighting purposes. This would be less than 2½ p.ct. of last year's output, which indicates what we have already referred to as the smallness of the scope for economy in this direction. But the gas industry does not consume the 4½ million tons of coal, much less the 18 million tons; for it returns (in addition to the gaseous fuel) approximately one-half of the weight of the coal to the solid fuel market, besides the tar, the crude benzol, the sulphate of ammonia, and the sulphur, in and among which resides such immense wealth for the country's use. A new complexion (our illuminating engineering and electrical friends will note) is given to the matter when the net amount of fuel—not coal—that the gas industry employs to provide light is considered; and, what is more, we are now looking forward to a reduction of the quantity of fuel per unit of gas produced, which brings us to a further point raised by Mr. Proctor.

Agreed that the lighting field does not offer much scope for coal economy under present conditions, the thoughts of the illuminating engineers were turned by Mr. Proctor to the potentialities of the power field, which is not their particular province. Admittedly there is big scope for economy in this direction. But the economy is not to be achieved by any drastic measures. The Bristol Electrical Engineer would make the use of "raw" coal allowable only under licence. It has taken a long time to move electricians to this way of thinking; and their sudden conversion is very amusing to old coal carbonizers. Even now the fact requires impressing upon them that reform should begin at home, in order to enable them to speak with freedom and authority. Private suppliers of their own power should, in Mr. Proctor's opinion, now be compelled to forsake their wasteful ways, and couple-up to the town electric-supply mains. There is a smack of Prussianism about Mr. Proctor's notions in this regard. Mayhap there is some other way by which even greater economy could be attained. There is more than one scheme on board directing to economy in the power field. It is not altogether a question of power only by private plants; for many users of gas-driven generating plants can point to an average cost per kilowatt-hour for lighting and power which is below what would be the average charge by the local electric supply station. Would Mr. Proctor compel such factories to give up their economy and increase their works' costs so as to produce greater advantage for the electricity generating station? The scope for the electric-motor is among the private users of steam plants. But here again the gas industry is ever pushing forward. There is no reason why the private owner with steam-boilers large enough for his requirements, and with forced-draught arrangements, should not use coke; there is no reason why, as the gas industry makes cheaper gas—maybe of a lower calorific power, but a good combustible gas, giving good value for money—

every steam-engine user should not convert to gas-engine driving and do away with boiler-house and steam plant, or, if he prefers his steam-engines, and does not like coke, he could turn to gas-firing.

There is no question whatever this great problem of fuel economy is being looked at in an amateurish sort of way by some people who fail to make an inspection from every point of view. Great economies may be possible in ways other than those seen by the single-point-of-view observers. Fortunately, the Coal Controller has about him some reliable experts; fortunately, too, the Board of Fuel Research has upon it men of repute in this matter of the scientific utilization of fuel.

The Warning.

Under control, while no unseemly scrambling for coal supplies will be permitted, it will be necessary this summer for every responsible gas manager to look well after his own works, and see that he personally leaves nothing undone which he ought to do to ensure that his undertaking, his district, and consumers are amply protected in respect of gas service for next winter. One way in which he can assist in relieving the expected, and almost certain, difficulties of the winter is to at once get his water-gas plant at work making blue or lightly carburetted water gas for admixture with the coal gas, so that every possible saving may help towards the coal accumulation. The Coal Controller has established about himself a large active expert system, which reaches far and wide; but the system will need to be supplemented by the maximum individual help of both large and small users. The necessity for all large coal consumers to make the best use of the light summer months is accentuated by the appeal that the President of the Board of Trade (Sir Albert Stanley) made the other night in the House of Commons to such relatively small coal users as householders, to be wise and lay in their stores of fuel while there is time, and before the almost inevitable coal rationing comes about next winter. The less heed that is taken of the present warning, the greater will be the trouble next winter, and the smaller the "rations." More locomotives and rolling stock are going over to France, a further reduction of available labour is proceeding now and continuously, transport by sea will become more difficult as the days become shorter and travelling conditions are upset by fogs and storms—to say nothing of troubles with submarines and mines, and the lowered level of available tonnage. Despite all the warnings, there will be many "foolish virgins" who will approach next winter without their coal-cellars filled. It is hoped there will be few gas-works that will then be in unpleasant predicament. All the arguments that can be advanced as to extra costs attaching to large storage are well known; outweighing them are the arguments that in these exceptional times can be put forward in favour of heavy stocks. We are also acquainted with the enormous difficulties there were last summer in obtaining deliveries for storage. The machinery of the Coal Controller's Department was not then in existence as it is now for reasonable use.

Southern District Association at Exeter.

That the spring meeting of the Southern District Association of Gas Engineers and Managers held at Exeter last week should be unanimously pronounced an unqualified success by all present is no matter for surprise. It was not by any means the first gathering of gas engineers at Exeter; and former visits created a favourable impression that was thoroughly sustained upon the present occasion. In the first place, the Association always feel assured of a cordial welcome from the Directors of the Exeter Gas Company. They are busy men; but, with the exception of the Chairman, who did not fail to send a kindly message of welcome and apology, they all managed, not only to meet the visitors at luncheon, but to be intimately in touch with them throughout the proceedings. Encouraged by this sympathetic backing, on previous occasions Mr. W. A. Padfield always took care that no stone was left unturned to ensure the enjoyment and benefit of the visitors; and his successor in the Presidential Chair, and in the service of the Exeter Gas Company, has been no less determined to worthily maintain the excellent established reputation. The arrangements in connection with the meeting must have involved no inconsiderable trouble; but Mr. W. H. Westlake now enjoys the knowledge that his efforts, not only as regards the main objects, but also the social and recreative side, were appreciated as an acceptable relaxation after the exigencies of the past winter. A welcome feature of the gathering was the presence of Mr. James Lowe, Mr. H. Morley, and Mr. W. A. Padfield.

The "Plotters" and Sulphate of Ammonia.

A good many among us are now more interested in the cultivation of land produce than ever before. If we have not a piece of land of our own on which vegetables are being grown, we bless those who have, because the fact gives us hope that the lessened requirements from the local greengrocer of our industrious neighbours will improve our own purchasing power. But whether or not gas men have ground of their own, there is something that they can do, and that is to help to render the land of allotment holders more prolific by advising as to the quantities, mixtures, and methods most suitable in the application of fertilizers to the particular soil under cultivation, because just as crops require different treatment, so do lands. The quantity of sulphate of ammonia that is needed for the purpose may not be large; but to show our neighbours how to reap the richest possible harvest is doing a good national work, besides providing a fine local advertisement. We cannot help admiring the practical methods adopted by Mr. J. Mogford, the Engineer and Manager of the Briton Ferry Gas-Works, in going about his educational and advisory work. What he did can be read in the paper submitted to the Welsh Association last Wednesday. He himself became a "plotter" in a double sense. He took an allotment among others, and gave his neighbours something to talk about as to how to make the earth yield her increase. He succeeded where others were disappointed. They are all succeeding now who have followed his example, and have taken his advice as the fertilizing expert in connection with the District Council's Allotment Committee. It is remarkable how even these cottage gardeners knew something about the virtues of nitrate of soda, but were ignorant as to the superior ones of sulphate of ammonia. The methods of getting nitrate of soda known seem to penetrate deeper than those employed in connection with sulphate of ammonia

Gas Companies and Electricity Deficits.

Gas companies working in districts where the local authorities have electricity concerns running at a loss, have always, as competitors and ratepayers, just cause of complaint at being called upon to pay out of their gas revenue—whether or not they have made a fair profit themselves—money for the purpose of giving support and relief to their rival. Especially hard is this condition just now, when, working under war conditions as well as statutory curbs, it is difficult enough to get a little surplus for dividend purposes. But the fact remains that, in spite of the increased rates charged for electricity, there are a large number of municipal electricity undertakings that have come heavily upon the rates—just when gas companies among other ratepayers can least afford to contribute to the support of the electricity undertakings and to the payment of the expense of providing other people with their lighting and power agent. It is time that combined resistance should be made against this state of things, and for an alteration of the law which admits of such a Gilbertian situation. Simple protest is no good whatever. The South Suburban Gas Company have made complaint to the Beckenham District Council regarding a rate being levied to make up the deficiency of income on the Council's electric undertaking. The Company suggest as an alternative that the Local Government Board should be asked to postpone the repayment of loans during the period of the war. The Council are placing the letter before the Board. But the idea has not been favourably entertained before, so that there is not much chance of it being accepted now. But why should not the Council raise their charges to a sufficient height to bring in a revenue adequate to meet their liabilities? That is what a gas or electricity company has to do; and if a local authority cannot do the same as an electricity supply company, then there is something wrong. At any rate, there is no justification for asking ratepayers generally, including the competitors of the electricity concern, to assist in paying the cost of supplying other people with light and power.

Calorific Standard Application and Orders.—The Hartlepool Gas and Water Company have applied to the Board of Trade for a Calorific Standard Order; the figure proposed being 500 B.Th.U. The Board have made Orders for the Bournemouth Gas and Water Company, the Shrewsbury Gas Light Company, and the Tottenham District Light, Heat, and Power Company.

OBITUARY.

Mr. W. Holloway, who has died at the age of 71 years at his residence at Eaglescliffe, was formerly Works Manager for Messrs. Sadler and Co., Ltd., chemical manufacturers, of Middlesbrough, and was a lifelong friend and colleague of the late Sir Samuel Sadler.

A large circle of friends will much regret to learn of the death, on the 11th inst., of Mr. W. S. Smart, Chief Draughtsman to the Birmingham Corporation Gas Department. For a considerable time his health had been poor, and for several weeks he had been confined to his room; but the end came with unexpected suddenness. Mr. Smart was appointed Assistant Draughtsman at the Saltley works in June, 1905, and held the position until November, 1911, when he took up the post of General Manager to Messrs. W. J. Jenkins & Co., of Retford. After more than three years with Messrs. Jenkins & Co., however, his health became seriously impaired, and he resigned. In September, 1915, he was appointed Chief Draughtsman to the Birmingham Gas Department, and, under Mr. E. B. Tomlinson, drew up designs for the installation of horizontal retorts with Fiddes-Aldridge stoking machinery, and the coke-screening and telpher plant, which have for some time past been working satisfactorily at the Nechells works. He also outlined several designs of plant, &c., for the new works which will be erected in the near future at Washwood Heath. Mr. Smart was the first member to read a paper when the Midland Junior Gas Association was formed, in 1905. At the time of his resignation from the department in 1911, he was Senior Vice-President of the Association, and since his return to Birmingham had again been elected to a seat on the Council.

PERSONAL.

Corporal H. Osborne, Durham Light Infantry, who has been granted the Military Medal for distinguished conduct on the field, was prior to enlistment employed by the Drighlington Gas Company.

Mr. Standish, Rental Superintendent of the Swansea Gas Company, has been notified that his only son, Lieutenant C. Colin Standish, has been killed in action. His promotion from a private was earned on the field; and in October of last year he was awarded the Military Medal.

The Directors of the Sittingbourne District Gas Company, at their meeting last week, appointed as their Engineer and Manager, Mr. Ernest J. Hobbs, the Assistant at the Isle of Thanet Gas-Works, Margate. There were 53 applicants for the Sittingbourne appointment, advertised in the "Journal" for April 24.

Mr. Alexander Mackay, of Motherwell, has been appointed Gas Engineer and Manager to the County Borough of Stoke-on-Trent, in succession to Mr. L. J. Langford, now of Tunbridge Wells. Mr. Mackay has, in connection with his new post, supervision of four gas-works, each having its own Station Manager.

Mr. Henry How, at the last Directors' meeting of the Sevenoaks Gas Company, tendered his resignation (through ill-health) of the post of Secretary which he had held for forty years. Mr. J. H. Donaldson has been appointed by the Board to fill the vacated position in addition to his former one of Engineer and Manager.

In another column to-day appears a report of the proceedings at last week's meeting of the Illuminating Engineering Society. As "Journal" readers are aware, the Society, dealing with the scientific and industrial aspects of a wide subject, unites on common ground gas engineers, electrical engineers, manufacturers of lamps and shades, physicists, ophthalmic specialists, architects, and surveyors. This branch of engineering has been recognized by the appointment, under the Department of Scientific and Industrial Research, of a Joint Committee on Illuminating Engineering. The successful union of these various interests is, it may be pointed out, largely due to the efforts of Mr. Leon Gaster, the Hon. Secretary, during the last ten years. Mr. Gaster is a British subject of Roumania origin, and so is doubly associated with the cause of the Allies. We learn that all the male members of his family in Roumania and in England, who are of military age, are fighting for the cause, and one of his nephews was recently killed in Roumania.

Manchester District Institution Meeting to be Reported.

An intimation appeared on p. 279 of last week's "Journal" that, owing to the important subjects to be considered at the meeting next Friday of the Manchester District Institution of Gas Engineers, it had been decided to hold this meeting in private. We are pleased to be able to state, however, that, in a letter written by the Hon. Secretary (Mr. G. S. Frith) last Friday, he said he had been in communication with the President (Mr. W. Whatmough), and they had now determined to admit the Technical Press.

The value of natural gas produced in the United States in the twenty years from 1885 to 1915 was $1,156,753,000.

ELECTRICITY SUPPLY MEMORANDA.

Some people are interminably discontented and envious, and constantly harbour the idea that somehow or other, as far as they are concerned, justice is always sneaking away from them round a back corner, while injustice is ever in the open getting its own way to their disadvantage. Both "Meteor" and the "Electrical Times" are discontented over the showing the electricity industry makes in the new Schedule of Protected Occupations, and envious of that of the gas industry. With its own showing the gas industry is not over-pleased; but the scowl on the face of our electrical contemporary is not an agreeable sight. The contrast between gas and electricity is "scandalous," and electrical engineers are advised not to accept the position with equanimity. The gas industry has a long list of technically titled men in the schedule. It looks complete, even to the outdoor plumbers "who go smiling to their daily round of crime." The completeness is the judgment of ignorance—an ignorance confirmed by the use of a word "gasometers" which departed from the nomenclature of the gas industry (though still beloved by outsiders) when means of measurement apart from storage were first introduced. The protected list of occupations for the electrical industry embraces station or sub-station engineers, switchboard attendants, shift engineers, and cable jointers; but it does not include stokers and drivers, which is a grievance. This coming on the top of the recent tribunal reference to an electric supply station as a "funk hole" and an "umbrella factory," and of the refusal at other tribunals to exempt military aged station engineers unless some very special reason for doing so be assigned and substantiated, has enabled friend "Meteor" and his paper to find cause for contempt for the whole treatment of the electricity industry in respect of labour. "Is not the electrical industry every whit as essential to the success of the war as the gas industry?" We dare not say "No," as in his present mood we do not know what "Meteor" might do. But the remark may be ventured that we have not heard of the electrical industry doing more than supplying light and power to munitions works, while the gas industry is supplying light, heat, and power as well as the ingredients for the making of explosives, antiseptics, a wonderful specific, and a fertilizer of excellent character—a range of service unequalled by any other statutorily controlled industry. It is only in munition areas that electrical undertakings are actually helping in war work; while every little gas undertaking, in producing gas, tar, ammoniacal liquor, and spent oxide, is contributing to the needs of the country in connection with the war. The "Electrical Times" would like the electricity supply industry to "swop leaders" with the gas industry. Our contemporary knows its leaders; we are quite willing to peremptorily reject them on our contemporary's inappreciation of their services.

Thin Protection.

Substitution.

The "Electrical Times" appears to overlook that the authorities have a pretty clear notion now, after nearly three years' experience, of the relative importance in the war of the industries; and they know too how far substitution can be carried in most of them. The gas industry has been through the mill, and was found wanting in regard to substitution, in that there were many undertakings that had obtained and were utilizing the services of women in occupations that the managers of other concerns said could not be filled by the fair sex. It is no use telling the authorities this sort of thing when they hold such a practical form of denial as the actual experience of other undertakings. Much the same thing has been going on in the electricity industry. It has boasted to the authorities of the small amount of labour it required for its work, and has submitted to them the necessity for the labour being skilled. But if our contemporary reminds itself of what took place when the President of the Institution of Electrical Engineers (Mr. C. P. Sparks) headed a deputation to the Reserved Occupations Committee, he will gather from the interview that the Committee were pretty well informed as to the capabilities of women as substitutes in electricity stations; for the Chairman of the Committee observed that, although some of the undertakings might have done all that was possible, the Committee wished to bring all into line. He therefore requested the deputation to consider what additional classes could be replaced by women, and ascertain to what extent substitution had already been made. This seems, at all events, to suggest that the Reserved Occupations Committee were well acquainted with the class requirements of the electricity industry, though we can hardly fancy the women doing the work of the stokers and engine drivers.

Heaped-up Discontent.

The matter dealt with in the opening paragraph is not the only one over which the "Electrical Times" has lately been grumbling. There is the composition of the Board of Trade Committee appointed to consider the question of putting the industry on a firmer foundation by enabling it to produce electrical energy at a cheaper rate. There is also the nomination of Mr. C. H. Wordingham as President of the Institution of Electrical Engineers, to which reference was lately made [*ante*, p. 184]. The nomination did not, nor does it yet, please our formerly spirited but now hypochondriac contemporary, despite

the fact that the Manchester Local Section of the Institution of Electrical Engineers and the Lancashire and Cheshire members of the Incorporated Municipal Electrical Engineers have made a protest against the attack on the amiable Mr. Wordingham. About the helping hand the President of the Board of Trade offers the electricity supply industry, he will begin to wish that he had left the industry to do the best it could by following unaided its own devices; for within the industry he seems to have pleased few, and has certainly not satisfied many. If properly captained, the "Electrical Times" believes the electricity industry is the one which can benefit the nation most after the war. This is full-blown conceit and presumption—presumption in giving the electrical industry precedence over all other industries in power to contribute to the national development. "Megohm," in a long-winded letter to our contemporary, regrets that the men of the electricity industry have been too busy to recognize the importance of the action of the Board of Trade, and of the possible effect of the findings of the Committee on the future of their undertakings and themselves. He urges protest; he deplores the ignoring by the President of the Board of the organizations of the electricity industry; he sorrows over the little influence the Institution of Electrical Engineers has attained in Government circles. He cannot see that the West Ham idea (noticed last week), that it should represent municipal electricity supply on the Committee, would cure the organic defects of the latter. The London and Provincial companies are inadequately represented. It is urged that there should be a demand for the Committee to be dissolved, and a new one appointed; that there should be a deputation of a Joint Committee of representatives of the various Associations of the electricity supply industry to the President of the Board regarding the matter; and that such Joint Committee should form the nucleus of a National Electric Supply Association, to be developed and worked on the lines of the National Electric Light Association of America. "Megohm" does not leave any roads open by which to escape; for he throws a barrier across them all in the shape of this question: "Will the President of the Institution of Electrical Engineers give a lead, and will the various Associations agree to combine strenuously to support and protect the very important interests they have in common?" We doubt whether any good will come from all this ebullition of discontent; for West Ham has already been set aside by the President in the statement that he appointed Alderman Spencer, the Chairman of the Halifax Corporation Electricity Supply Committee, as a member of the Board of Trade Committee to represent the interests of municipalities, and that he does not see his way to increase the number of members.

Wiring and Firing.

In the "Memoranda" for Feb. 20, attention was directed to a criticism by the "Electrician" of the bulky character of the American National Electrical Safety Code. Our contemporary seemed to have some fear that the heavy accumulation of rules for attempting to ensure safety in electrical installations of all sorts would tend to frighten people. Mr. S. W. Stratton, Director of the Bureau of Standards, Washington, has written a long letter to our contemporary, defending the volume, and showing that it is not so terrible when an analysis is made of its contents. He does not make a bad job of the defence. Whether or not the national electrical safety code is overdone, it is certain that better guidance was required before the appearance of this supply of rules in bulk. Says Mr. Stratton: On account of the dependence on the unguided common sense of those concerned in the electrical industry, and of those who undertook to administer varying, incomplete, and especially uncodified rules in the various administrative jurisdictions, states, or cities, the electrical fatalities from overhead lines in this country amounted in 1913 to approximately 600, while those in stations, factories, and other places where electricity is handled were about equal in number. It was quite evident that the companies and the administrators did not have sufficient understanding of the hazards or sufficient guide for their abatement. The non-fatal accidents, of course, were *very many more*. It must be remembered, too, that it is frequently the worker, not the company or administrator only, who determines from a study of the rules whether safety is assured or not, and who brings hazardous conditions to the attention of those in authority. Within a week after Mr. Stratton's letter was published, a cablegram from New York, dated May 10, announced that the City Hall burst into flames at midday. The building had been covered with bunting the previous day for a reception in honour of the Allies, and this was damaged. At night time there was a brilliant electric illumination; and it was suspected that defective wiring was responsible for the fire, which burned for an hour before it was got under control. The event suggests that perhaps those responsible for the temporary wiring of the City Hall had not had time to study carefully the safety rules. But Mr. Stratton must not expect that the American code has been brought to perfect condition on the first essay. If it has, the American electricians have beaten hollow the British Institution of Electrical Engineers. Several revised editions of their wiring rules have been published. Yet in the recently issued report of the Council of the Institution, it is stated that a number of further alterations in the rules have been submitted for the consideration of the Committee; but it is not proposed to undertake an additional general revision until after the war. It is also mentioned that the research on the heating of buried cables has been continued; the expenditure during 1916 being £960, of which £840 was provided by the Government Department for Scientific and Industrial Research. It was about time, if only in the interests of the much maligned gas industry, that such an investigation was carried out.

Coal, Steam Plant Capacity, and Power Charges.

We have, on various occasions recently, remarked upon the relationship of prices for coal delivered and other higher expenses to the contract charges ruling in many places for power supply. They are altogether out of gear now, and are helping to create those deficits that ratepayers are called upon to pay. There is another factor; and it is that the dirty coal that is now being supplied has greatly reduced the steaming capacity of boilers. The point has been raised at Gloucester; and it has been necessary there to apply for sanction to a loan for the installation of induced draught plant for improving the evaporating efficiency of the boilers. On the point as to power charges, there have been at Worcester long negotiations with the Tramways Company as to an increase in the charges for energy, on a sliding-scale basis, according to the price of coal. The contract between the Council and the Company was for twenty-eight years, with the right of revision of the terms at the end of fourteen or twenty-one years. The charges fixed at the beginning of the term were 2d. per unit for the first 200,000; 1¾d. for the next 200,000, and 1½d. for any remaining quantity. The Chairman of the Corporation Electricity Committee (Mr. J. Hill) states that, at these prices (which are not low ones as power charges go) most of the members were under the impression that the contract with the Traction Company was a good thing for the electricity undertaking, and that a fair profit was being made out of it. But, after investigating the figures for fourteen years, he had come to the conclusion that, on the whole, the revenue had not been satisfactory. Conditions, of course, alter the financial results of trading; but when one has regard to the prices mentioned by Mr. Hill, it is pretty certain that there are a good many electricity concerns that would, upon investigation, find they would be, in present circumstances, much better off without some of their running contracts. So would be the ratepayers. What is more, coal is not going to rush back to pre-war prices when happily peace again reigns over the earth.

Looking Forward.

We "lift" the following as it stands from "Cooking and Heating Notes" in the "Electrical Times:" "Evidence is accumulating as to the diminishing demands for electrical energy for lighting owing to the restrictions as to lighting, the operations of the Daylight Saving Act, and the more general use of lamps of higher efficiency; and when the war ends and the demands for power for munition works cease, engineers in control of electrical undertakings will need to look around for new sources of revenue. This fact, we note, is being recognized by Mr. A. H. Seabrook, the General Manager of the St. Marylebone undertaking, who, in his quarterly report to his Council, says: 'The increase both in output and income is entirely due to uses other than lighting—indeed, the proportion of lighting sales to the whole steadily tends to diminish owing to the higher efficiency of lamps. Hence the importance of encouraging the use of electricity for heating, cooking, and all domestic and industrial purposes.'"

DECIMAL WEIGHTS AND MEASURES.

MANY times during the last twenty years and more have our columns borne witness to the continual interest in, and advocacy of, the adoption of a decimal system of weights and measures—and possibly also of our coinage. As far back as July 9, 1895, our "Editorial Notes" contained comments upon the unanimous report of Sir Henry Roscoe's Select Committee, which strongly favoured the legalization and adoption of the metrical system. Later (on Nov. 26 of the same year), in recording the criticisms and observations of Mr. A. J. Balfour in reply to a deputation on the subject, we were conscious of the difficulties in the way, but we could perceive "clearly enough that the balance of advantage would be on the side of making a clean sweep . . . if it were only worth while to have a fresh start." In 1899 the matter cropped up again, and was even referred to as "that 'hardy annual,' the plea for the compulsory introduction into the United Kingdom of the metric system of weights and measures." There followed a lively and interesting discussion in our "Correspondence" columns; but there, for a time at least, the matter seemed to rest. It would be easy to show varying shades of opinion, and different points of view taken up at different periods—fluctuating, possibly, under the modifying influences of persons and conditions from time to time.

All this historical reminiscence, as it were, is, however, only useful in so far as it serves as a reminder of a past attitude and as an indication of a future possibility. For if we all are not prepared to shed our past prejudices and traditions, and to approach old problems in a new way, then we shall not have learned to the full the lessons put before us since August, 1914. It was, we gather, with some such idea as this in his mind that Mr. Harry Allcock, M.I.E.E., delivered a very interesting and informative lecture on "The Decimal System of Coinage, Weights, and Measures" before the Institution of Civil Engineers on March 27 last, which has just been issued in brochure form. Of

peace problems, the author points out, one of the most urgent will be the development of our productive power to the utmost and the extension of the sales overseas of our manufactured goods. The war equipment of modern plant and labour-saving machinery will have to be diverted to securing a greater output in peace of all kinds of British goods. "We should approach our commercial problems . . . fired by the resolve that no longer will we be bound by the hampering influences which have hitherto handicapped us in our endeavours to expand the volume of our trade with the rest of the world." Trade follows the line of least resistance; and the language used to describe the articles of trade should be that of the countries in which we wish to carry on our present business or to introduce new. We want world-wide trade, and, as far as possible, a universal system of currency, weights, and measures.

It is not necessary to follow the author in detail in his comprehensive compilation of the coinage systems of the world. It may suffice to point out that the British system differs from others in two notable ways—in an isolated abstention from the decimal basis, and in the retention of a high value monetary unit. It is not to be forgotten that even within the British Empire decimal coinage is to be found in Canada, Egypt, and elsewhere in the East. Any change in our coinage, the author wisely observes, should retain as much as possible of our present system, and reduce inconveniences to a minimum. He suggests, therefore, the sovereign (or ten florins), half-sovereign, florin, shilling, and quarter (or former sixpence); and in nickel, 10c. and 5c.; and in bronze, pieces of 4c., 2c., and 1c. The former objection—of depreciation in the value of the bronze coins—no longer applies in these times of violent changes in values. The very fact of these widely fluctuating values makes the present time an opportune one for the changes advocated.

Turning to weights and measures, the desideratum is one universal language of quantity. The metric system is being progressively adopted; and no country having taken it up has afterwards dropped it. But piecemeal adoption is impracticable. The author remarks, with acumen, that "the position is analagous to that of the Daylight Saving reform. No benefit could be derived from that reform until it was made compulsory . . . ." Of the United States or the United Kingdom, whichever first adopts the system, the other will be bound to follow. The engineering difficulties of the change are considered. In a new draft Metric Bill it is provided that "nothing shall affect the manufacture or use of any machinery, tool, pattern, sieve, template, or other article made by measures other than metric measures;" so that manufacturers could carry on as at present in so far as manufacturing went, as distinct from buying and selling. Existing patterns need only be replaced as and when worn out. It is noteworthy that the British Engineering Standards specifications are being circulated in cheap editions throughout the world, the metric equivalents being given. Educational and other advantages of the change were also emphasized by the author.

The discussion which followed was, with some few exceptions, markedly inadequate and at an unusually low level. Sir Guilford Molesworth referred to changes he had made in Ceylon and India. Mr. Oliver Bury, from his experience in South America, strongly urged two things—a knowledge of Spanish or other language, and the adoption of the metric system. Mr. C. P. Sparks, the President of the Institution of Electrical Engineers, supported the author. Sir Archibald Denny voiced the conservative views on the subject, and praised the British inch. Professor W. C. Unwin gave the information that the Engineering Standards Committee had decided to adopt certain metric standard sections. Mr. J. A. F. Aspinall, the General Manager of the Lancashire and Yorkshire Railway, thought that the alteration of weighing machines and gas-meters would involve considerable cost.

Let us conclude interrogatively. Difficulties there are; will it not be to the advantage of the Empire as a whole, and in its relationships with our Allies, for these difficulties to be overcome, and for us to adopt as soon as possible, and as far as possible, a uniform decimal system?

COKE FUEL MOTORS.

By E. W. L. Nicol.

> "The fuel problem is one of ever-increasing difficulty. Petrol at its present price contributes appreciably to make motoring of less commercial value than it would otherwise be. Petrol will not be procurable indefinitely, and the end of each year witnesses more anxiety as to the supply."—R.A.C. Journal, May, 1914.

The influence of fuel costs on the development of the mechanical transport industry becomes more apparent with the increasing extent to which petrol motors are being abandoned in favour of steam-driven vehicles. With a view to securing lower fuel costs, many commercial motor users are adopting steam-wagons of the ordinary locomotive type, only to find themselves involved in difficulties in the matter of fuel supplies, owing to the wagons purchased being fitted to use relatively expensive Welsh coal—now practically unobtainable. Other kinds of coal are used only at the risk of prosecution for smoke emission, with consequent delays and annoyance.

The present conditions of scarcity and high cost of the staple motor fuels—namely, petrol, paraffin, and Welsh coal—may be expected to continue far into the future. For reasons which should be obvious, normal supplies of imported spirit at reasonable prices are unlikely to be available immediately after the cessation of hostilities; and, to help pay for the war, smokeless Welsh, which is the most concentrated coal available, and therefore the most economical in tonnage, will probably be exported to a much greater extent—thus stiffening the price to the home user.

Nor will the trend of events in America tend to improve the immediate prospect of abundant supplies of petrol and fuel oils. The surplus available for export, after the rapidly increasing home demand in America has been satisfied, must be rapidly diminishing; and it is, moreover, largely in the hands of the big "combines," who will no doubt seek to take full advantage of the situation. The rate of increase in the American home demand, and consequent diminution in surplus available for export to this and other countries, may be gauged by the output of one large firm of petrol motor builders, which is said to be 1300 motors per day, or (say) 375,000 per annum. Taking the average yearly petrol consumption of each at 500 gallons, the rate of diminution of surplus due to the output of this firm alone is, therefore, about 187 million gallons per annum. Petrol substitutes, so far as they are available, will naturally follow petrol very closely in the matter of price, as recent experience has shown.

The extent to which the recovery of benzol in this country may be expected to relieve the situation, can be estimated with some degree of accuracy. Benzol is recoverable in the process of coke and coal-gas manufacture to the extent of about 1½ gallons per ton of coal carbonized, but is necessarily limited in quantity by the amount of coal so treated—viz., some 36 million tons per annum. The total quantity which could possibly be made available from this source could, therefore, not exceed 70 million gallons—a relatively small amount compared with the total quantity of petrol normally imported, and sufficient only to supply the needs of twenty weeks' output of "Ford" cars. All available benzol, however, may be more usefully employed in developing the aniline dye industry. In view of the vital importance of benzol to the dye industry and, therefore, indirectly to the staple industries of the Midlands, no effort should be spared by those interested to support the gas industry by making use of coke as fuel in lieu of petrol and coal.

To those unacquainted with the details of its production, the inter-relation of benzol recovery and coke production should be made quite clear. Mainly with a view to absorbing surplus coke as well as preventing undue production, coke has, in the past, been used extensively at gas-works in the process of making carburetted water gas, which contains little or no benzol, and, moreover, is dependent upon imported mineral oil. It will be seen, therefore, that while it is to the national advantage, and also to the immediate interests of both the gas and the motor transport industries, to minimize so far as was possible the use of imported fuels and fuel material, it is incumbent upon those who wish to see abundant supplies of benzol, to assist by making use of the residual fuel, gas coke, which is the necessary concomitant of the production of benzol.

One important direction in which the use of coke might with advantage be developed is in steam-raising generally, and in particular for steam-driven vehicles. There is nothing new in using coke as fuel for this purpose, as the earliest types of steam-wagons were designed for use with this fuel exclusively. Restriction in tare weights has tended to limit the size of steam-wagon fireboxes, so that the use of the best quality of Welsh coal has become desirable and is often encouraged by the makers. Experience has shown that existing types of steam-wagons can be satisfactorily adapted to the use of suitably graded coke; while a comparatively new type—the "National"—has, as a special feature, facilities for automatic coke firing, so that coke may be used more conveniently. It is now proposed to adapt this type of chassis to public omnibus service; and this tendency might be encouraged with advantage to the national economic interests.

Tests extending over twelve months in actual service have proved this type of omnibus and wagon to be quite practicable, and, moreover, decidedly economical. Based upon the report of the R.A.C. Technical Committee, the average coke consumption on a run of 219 miles with a load of 2 tons 15 cwt. was about 4 lbs. per mile. At 25s. per ton, more than 7 lbs. of coke is obtainable for 1d. It will be seen, therefore, that very considerable economy in fuel cost may be realized by adapting existing omnibuses to the use of coke as fuel in lieu of the relatively more expensive imported oil or petrol. The daily coke consumption of a bus operating in the London area is about 4 cwt.; and the estimated daily consumption of a full normal service of 4000 omnibuses would be about equal to the coke production of one of the largest London gas-works.

A feature of the first dinner of the present season of the Pacific Coast Gas Association was the sending of the following telegram to President Wilson: "Resolved, that the Pacific Coast Gas Association, in public meeting assembled, tenders to your Excellency the united, loyal, and patriotic support of its membership, to be of such assistance to you and our nation as necessities may demand. The organization is composed of technical men who are used to problems and their solution, and bring with them in this tender of patriotic services the best wishes for you and your administration, with the assurances of loyal esteem and support." In response, President Wilson cordially thanked the Association for the goodwill which prompted the message.

SOUTHERN DISTRICT ASSOCIATION AT EXETER.

"The ever-faithful City," beloved and favoured of "Good Queen Bess," was looking its best on the occasion of the visit of the Southern District Association of Gas Engineers and Managers last Thursday. Though a far cry from the Metropolis, there was a good showing of Londoners present; Mr. W. Doig Gibb, Mr. W. B. Farquhar, Mr. W. E. Price, Mr. L. Trewby, and Dr. Colman being there. Of other prominent members noticed were: Mr. Percy S. Hoyte (Plymouth), Mr. D. H. Helps (Reading), Mr. C. S. Shapley (Southend), Mr. N. H. Humphrys (Salisbury), Mr. Thomas Glover (Norwich), and Mr. R. Beynon (Torquay). Further west, St. Austell was represented by Mr. H. E Riley and Truro by Mr. S. J. Ingram. Mr. H. C. Head, of Winchester, the Hon. Secretary of the Association, assisted Mr. Westlake in receiving the visitors, among whom was Mr. W. T. Dunn, the Secretary of the Institution of Gas Engineers.

The headquarters selected for the visitors was the Rougemont Hotel, where, on the previous evening, a party of about forty members arriving from long distances forgathered at the behest of the President (Mr. W. N. Westlake, the General Manager and Secretary of the Exeter Gas Light and Coke Company), who had thoughtfully asked them to be his guests at dinner. It was not possible for them to travel the following day and be in time for the first item of the official programme—a luncheon on the invitation of the Chairman (Mr. G. Hardy Harris) and Directors of the Company.

This luncheon was at the Rougemont Hotel—the Vice-Chairman presiding, in the enforced absence of Mr. Harris, who was occupied on important work which demanded his presence elsewhere. In the letter expressing his great regret at being away, which was read to the members, he paid a warm tribute to the ability and skill of Mr. Westlake, in carrying out his varied and important duties as the Company's Chief Officer. He has served the Company from his boyhood—scaling the ladder of promotion with that fine West of England spirit that made Drake and Frobisher leaders of men.

In Mr. Harris's absence, the pleasure of personally welcoming the members to the City of Exeter, fell to Dr. Perkins, another of the Directors, most of whom were present, including Mr. W. A. Padfield, for many years the Engineer and Manager.

THE TOAST LIST.

The CHAIRMAN (Mr. H. M. D. Wilcocks) having proposed "The King,"

Dr. PERKINS gave the toast of "Prosperity to the Association." He said that it afforded him the greatest pleasure to welcome the members to the ancient city. He hoped that the result of the visit would be that those who came from the smaller works would learn something, and those from the larger ones would teach the Exeter Gas Company something. The Association had done the Company the honour of electing their Manager, Mr. Westlake, as President. They could scarcely have paid them a higher compliment, or found a better man. The Directors valued Mr. Westlake's services very highly. He should like to add that they were pleased to see also their late Manager, Mr. W. A. Padfield, to whom the Company owed a deep debt of gratitude. He had by his past services extracted them from the mire of despondency and debt, and done a very great deal to build up the Company to the position of prosperity it occupied. They regretted the absence of the Chairman of the Company (Mr. G. Hardy Harris), who was a man with many calls upon his time. Unfortunately he had to be in London that day, in fulfilment of an important engagement. Gas was at all times an important commodity; and during the war it had been of especial service in the production of many things of great value to the country. They could only hope that the services which gas undertakings were rendering would not be forgotten, and that the day would come when they would be requited by the removal of many of the restrictions now placed upon them, so that they might be able to produce more gas and earn more money for the shareholders.

Mr. WESTLAKE, in responding, said he had to divest himself of his usual personality and speak on that occasion as President of the Association. He need hardly say how grateful they were to the Directors of the Exeter Gas Company for the cordial way in which they invited the Association to Exeter, for their generous hospitality, and for the permission given them to visit the works. In these respects, they had followed the traditions established by a long line of directors of gas companies. He would be ungrateful if he did not acknowledge the generous manner in which Dr. Perkins had referred to him, and to his services to the Company. For a good many years now, the Directors had favoured him with their confidence; and the trust they had shown in him had inspired him to do his best for the undertaking. Their confidence spurred him on in the hope that he might in the future be able to do still better than in the past. As to the Association, this was a time when questions of organization and united effort were much to the front. The war had made people alter their views in many directions. It had shown the urgent need of better organization in every department of life. Both among employers and employed, it was all a question of organization. It was not possible for individuals connected with a big industry to stand alone. Luckily, as he thought, the war found the gas industry fairly well organized. There had been some units outside the scope of their organizations; and there was a need for more unity and co-ordination of the different organizations under a commanding leadership. This matter had been to some extent dealt with; and whether it was going to be carried still further and improved upon, was a question for the future. With regard to the Southern Association, they had to recognize one difficulty, which rather exercised the minds of many members. Roughly speaking, it covered a district which was bounded by a line drawn from London to Bristol. In the eastern portion of this area, gas-works were numerous, powerful, and easily accessible; in the West, they were less numerous, less powerful, and more scattered. The problem which had presented itself to the representatives of the industry in this less favoured area was how the scattered units could be better organized and brought together. He could remember the time when a large number of gas undertakings in the West were isolated units, without co-ordination or that co-operation which was so beneficial to the industry and to the public. Happily, this state of things had passed away. An effort which was made some years ago to remedy the evil had borne considerable fruit; and they at least met more frequently. He hoped they would see as the result advantages to the undertakings and to the consumers. Still, there was need of something further; and he looked forward to an improvement on what had been achieved hitherto. Meetings of those connected with the gas industry in the West had not been so frequent as they desired. This had been pressed upon his attention during the past two months. There were some who were far away, and others at an intermediate distance, who found it often difficult to get up to town to meet their professional colleagues, and who were thus at a disadvantage. He trusted something might be devised in the near future in the interest of these scattered members, to interlink them with the whole body. He was sure, if this could be done, and the whole body be brought more together, members in the eastern part of the district would benefit as well as those in the western portion. He was not, however, going to propose on this occasion a solution of the problem, which was not an easy one. He hoped members would think about it, and so perhaps by combined effort find a solution in the near future.

Mr. W. DOIG GIBB proposed "The Chairman and Directors of the Exeter Gas Company;" remarking that he cordially endorsed what had been said as to their kindness in receiving and entertaining the members of the Association. It was common knowledge that the undertaking was in very capable hands, and was a very valuable property; and it was pleasant to hear from Dr. Perkins that the Directors were of the same opinion as they all were—that not the least valuable asset which the Company had was the services of so able, conscientious, and capable an Engineer as the President of the Association. Yet an engineer, however competent, could not make a company successful unless he had the confidence and co-operation of his directors; and they were pleased to hear there existed at Exeter that co-operation which could alone lead to success. The Directors had shown that day that they were not only worthy of regard as commercial men. They had given the Association what he was told was a real Devonshire welcome; and they all heartily appreciated it. In meeting together from time to time, the members were doing a most valuable thing from a public, as well as from a personal, point of view. There was no reason why gas engineers should be jealous or uncommunicative. They were all within their own ring-fences; and what they did in the matter of intercommunication could not come back upon their own heads as it might if they were in competition with each other. They thanked the Directors for their kind arrangements for the meeting, for their permission to visit the gas-works, and for the opportunity which all this afforded them of spending a short time in so beautiful, historical, and interesting a part of the country.

Mr. H. M. D. WILCOCKS, responding, said the Chairman of the Company, in a letter to Mr. Westlake regretting his inability to be present, had written: "As Chairman of the Company having the benefit of your services, I consider the Company, as well as yourself, should be congratulated that you should be selected as President for the current year. I feel convinced that such an Association as will be represented here to-morrow is of the greatest value to gas companies and their engineers." He (Mr. Wilcocks) entirely agreed with the opinion of Mr. Harris as to the value of such Associations, and the honour which was conferred upon the Company and their Manager by his election as President. When they came to visit the works, he thought they would agree that they had been kept fairly up to date; and they would certainly be interested in the vertical retorts, which had proved of the greatest value in saving labour.

THE INSPECTION.

The visitors then made their way by special tramcars to Alphington Road, near which the works have been erected. The Glover-West installation of verticals was closely examined. Women workers in overalls were to be seen loading-up coke, and engaged in other occupations on the works, which everywhere bore evidence of the application of a modern mind.

From the works the members were taken to the offices and show-rooms at Southernhay, where the same go-a-head spirit was noticeable. The fitters' shops are excellently equipped, and have lately been put to admirable use in connection with the City and Guilds of London practical examinations for gas-fitters. They are excellently adapted for such a purpose. Before separating the party had tea together in the Board Room, at the invitation of the Directors.

The attendance must have been very gratifying to the President, who can look back on the day as another one of unqualified success in the Association's history. It should have been stated that in the morning he had piloted the members round to view the principal sights of the city.

The following account of the works of the Exeter Gas Company and the progress of the undertaking has been kindly prepared by Mr. Westlake for the "JOURNAL."

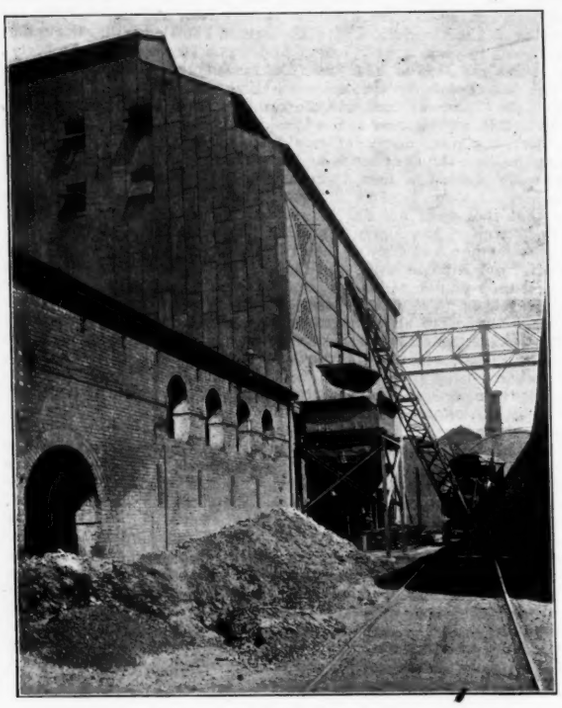
THE EXETER GAS-WORKS.

Gas lighting was introduced into Exeter at an early date. As long ago as April 10, 1815, it was announced in the "Western Luminary" that the shop of Alderman Phillips in Fore Street had been lighted with gas for some weeks. On the 27th of May, 1815, an Association was formed, named the Exeter Gaslight Company; and on the 11th of April, 1816, "an Act for lighting with gas the City and County of the City of Exeter" was passed. A site for a works was secured at Exe Island, near the river.

In 1836, another undertaking called the Exeter Commercial Gas Company was incorporated; but in 1839 the new Company was bought up by the old Company. The site at Exe Island has long been abandoned for the present more commodious one close to the Exeter Canal and the Great Western Railway—thus providing transit facilities by both water and rail. The early difficulties always experienced in establishing every new industry having been overcome, the history of the Company has been one of continual progress. This is illustrated by the following statistics:

	Make of Gas. C.Ft.	Make per Ton of Coal. C.Ft.	Sale of Gas, C.Ft.	Un-accounted-for. Per Cent.	Number of Customers.	Number of Cookers, Etc., on Hire.
1901 ..	274,389,000	10,241	253,615,400	6·09	5,922	2580
1906 ..	303,442,000	10,424	282,474,400	5·54	8,712	4527
1911 ..	355,277,000	11,242	341,204,400	2·71	11,628	6853
1916 ..	425,683,000	13,082	402,671,700	3·59	12,933	9103

In the Board Room of the Company is preserved a notice issued to consumers, dated April 29, 1839, giving the price of gas as 8s. 6d. per 1000 c.ft. In 1865, the price was 4s.; in 1914, it had been reduced to 2s. 4d.; now it is 2s. 10d.



The Vertical Retort-House, Coke Crane, and Hopper at Exeter.

With commendable forethought the present works were planned so as to allow gradual extensions for an eventual maximum output of 2 million c.ft. per day.

Until recently the whole of the carbonizing plant was hand-charged; and all the coal was handled by the shovel. It is still necessary in winter to use a portion of the fifteen benches yet existing. Discrimination has been exercised when introducing improvements. Nothing has been scrapped which still has at present a useful life.

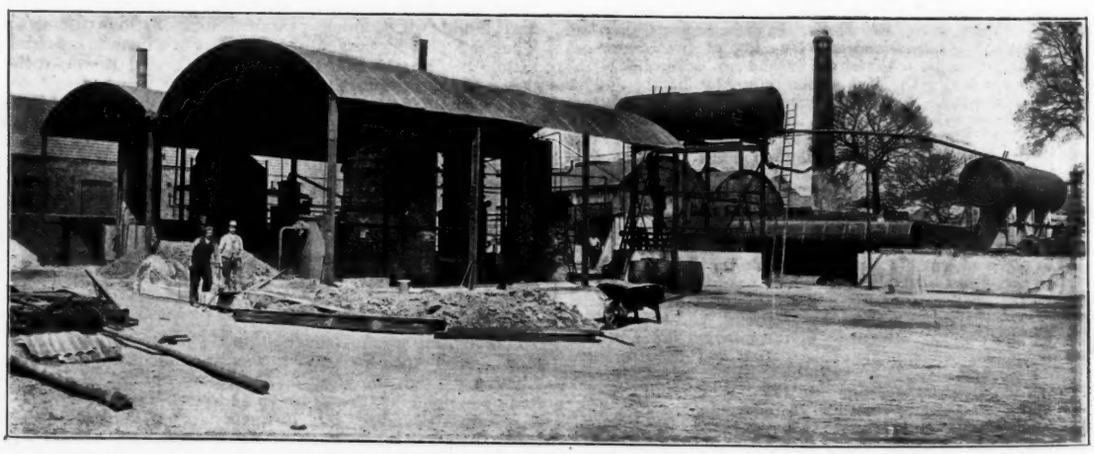
The visitors naturally concentrated their attention upon the new plant; but in passing it was noted that two vertical steam-engines are still efficiently driving two Waller four-blade gas exhausters, capable of passing 80,000 c.ft. per hour. The condensers are of the atmospheric type. There are two scrubbers 40 ft. high × 10 ft. diameter, filled with wood gratings; and a five-chamber Cockey washer, followed by two Livesey washers. The second of these was first used for tar-washing, but is now utilized for oil-washing. Contrary to the usual custom, the gas passes through the scrubbers first, and strong ammoniacal liquor is pumped through them. The gas is then treated in the Cockey washer with strong liquor in the first chamber down to weak liquor in the last chamber. There are six purifiers 24 ft. × 24 ft., and two catch boxes 20 ft. × 20 ft. The station meter, by Parkinson and Cowan, is capable of passing 100,000 c.ft. per hour. The four gasholders give a storage of 1,687,000 c.ft. The last one was erected in 1899. It has a maximum capacity of 779,000 c.ft. The sulphate plant is a continuous one, with an open saturator and automatic liming apparatus.

One of the principal features of the works is the coal-handling plant and the vertical retorts. Coal in normal times is brought by both rail and water. The canal wharf is immediately outside the works, and has siding accommodation for taking the Company's locomotive and trucks which receive the coal from barges by means of steam winches. All the coal, whether rail or water borne, is then tipped from the trucks by electric hoists into pits, from which it is removed by one-ton grabs attached to the travelling telpher and discharged into a hopper for elevating to the vertical benches or into the stores which surround the large retorts on three sides. The telpher track is slung from lattice girders by means of built-up L-shaped steel hangers, spaced about 20 ft. apart. The actual rail is mounted on the top of the track joist and is easily renewable. The generating plant consists of a 35 H.P. gas-engine coupled direct to a Siemens generator run at 255 R.P.M.

The vertical retorts are of the continuous type, and consist of five benches of eight retorts, 23 ft. long, or forty in all. The whole of them are enclosed in a house consisting of a steel framework filled in with bricks 4½ in. thick, 83 ft. long × 47 ft. wide. The retorts are built of silica. There are bunkers sufficient for 24 hours' supply of coal. The whole of the power required is supplied by gas-engines. The worm extracting gear is worked by an 8 H.P. engine in duplicate; the coal elevator by a 26 H.P.; and the lift by a 10 H.P. engine. For feeding the producers and retorts with coke, there is a small bunker; and wagons are filled from it, and elevated to the charging platform by the lift. The coal is first of all dropped into an overhead bunker, which in turn delivers into a reciprocating feeder for the coal breaker. The coal is then weighed by an automatic weigher capable of recording 30 tons per hour. A hopper is placed below the weigher to receive the coal as discharged, which then delivers into a rotary filler of the gravity-bucket conveyor and elevator.

The coke-handling plant consists of five tipping skips with carriages. The skips are loaded every two hours; wheeled on rails just outside the retort-house, and then picked up by a travelling crane for either filling the coke storage bunker from which the producers are fed, or else storing on the ground. The steam crane has a latticed jib capable of working at a 40-ft. radius and lifting a load of 25 cwt. free in any position. It has travelling wheels for 7 ft. 0½ in. rail-gauge. One of the conveniences of this crane is the ease with which coke can at all times be spread out and stored.

Away from the retort-house, and close alongside the sidings from the Great Western Railway main line, is the new reinforced concrete tar tank and the tar refining and benzol plants. The tank measures 80 ft. × 40 ft. × 12 ft. deep. It is partly underground, and capable of holding 230,000 gallons of tar. To avoid water



THE TAR AND BENZOL PLANTS AT EXETER.

trouble, the whole tank is built in a basin of well puddled clay, and has stood perfectly tight. The tar-refining plant is Wilton's, capable of dealing with some 4000 gallons per twenty-four hours. Steam for the pumps and benzol still is supplied from a vertical boiler with a forced draught furnace for using breeze. The benzol plant is a direct-fired one, laid out to face the tar-plant, so that a man working between them attends to both. The benzol plant is also of the Wilton pattern. The whole is covered with an open galvanized roof. Ample storage tanks for refined tar, light oils, and wash-oil are provided.

The works being at one end of the city, it has always been found necessary to have an office and workshop in the centre of the district. The present offices and show-room were erected in 1899; and, owing to the growth of the Company's business, it was found necessary to enlarge the workshops in 1913. Here complete provision has been made for working the distribution and fitting departments. An oven heated by high-pressure gas, and a sand blast plant is used for cleaning the cookers and other apparatus. There is a Bryan-Donkin Company compressing plant, in duplicate, consisting of rotary compressors and gas-engines capable of giving an output of 14,000 c.ft. per hour at 280 R.P.M. against 4 lbs. pressure, with ample room for another similar set if needed. These, in addition to affording a supply of high-pressure gas to the workshop, also feed one district three miles distant, and reinforce the supply in another situated at a low level.

ILLUMINATING ENGINEERING SOCIETY.

Annual Report of the Council.

The Annual Meeting of the Society was held last Tuesday, at the Royal Society of Arts, John Street, Adelphi. Mr. F. W. GOODENOUGH, the Chairman of the Council, presided during the business proceedings.

The principal business was the presentation of the annual report of the Council, which was read by the HON. SECRETARY (Mr. Leon Gaster). Dealing with the membershtp, it stated that, during the past year, it has been well maintained. It is hoped, however, that in view of the increasing recognition of the value of the movement, further support will be forthcoming from undertakings throughout the country engaged in the supply of gas and electricity. With pleasure, the Council record that the Presidents of the Institutions of Gas and Electrical Engineers—Mr. A. E. Broadberry and Mr. C. P. Sparks—have consented to act on the Council during their tenure of office. Mr. Broadberry, Mr. H. E. Jones (President of the National Gas Council), and Mr. D. Milne Watson (Managing-Director of the Gas Light and Coke Company) have been elected Vice-Presidents; and Professor A. Blondel has been nominated an hon. member of the Society in recognition of distinguished services rendered to the study of illumination, and as one of the leading French scientists interested in this field. The Society has sustained a great loss in the death of Prof. Silvanus P. Thompson, whose able conduct of its affairs during its first four years of existence will not soon be forgotten. The Council are considering an appropriate method of commemorating his name in connection with the Society. In the death of Sir Corbet Woodall, D.Sc., the late Governor of the Gas Light and Coke Company, the gas industry has lost a distinguished representative, and the Society a valued honorary member.

JOINT COMMITTEE TO DEAL WITH ILLUMINATING ENGINEERING

The report proceeded to review the meetings held during the year; and then it was mentioned that Committees of the Society have been engaged on experimental work and investigations for Government Departments in connection with the war. Referring to the Department for Scientific and Industrial Research, established by the Privy Council, the report stated:

The Research Committee of the Society, having prepared a list of subjects requiring attention (some of them being of pressing importance owing to the war), approached the Department; and a deputation was received on March 6 by Sir William M'Cormick, the Chairman of the Advisory Council of the Department. The deputation consisted of the following officers and members of the Society: Sir William Bennett, K.C.V.O., F.R.C.S. (President), Mr. A. P. Trotter (Senior Vice-President), Mr. F. W. Goodenough (Chairman of Council), Mr. Frank Bailey (Vice-Chairman of Council), Mr. L. Gaster (Hon. Secretary), Mr. A. Blok (Optical Glass Department, Ministry of Munitions), Lieut. S. R. Mullard, R.N.V.R. (R.N.A.S. Laboratories, Imperial College of Science, and Edison and Swan Lamp Research Department). Each member contributed some account of the work in which he was interested, and pointed out the directions in which research is needed. The deputation asked the department to form a Joint Committee to deal with Illuminating Engineering. It was pointed out that the Society is in a specially favourable position to co-operate in such work, in view of the representative character of its membership, including gas and electrical supply companies, manufacturers of lamps and lighting appliances, and scientific experts.

Sir William M'Cormick, on behalf of the Advisory Council, promised to give the proposals of the deputation favourable consideration, and the result was the appointment of a Joint Committee on Illuminating Engineering, working under the department. For the purpose of bringing it into touch with existing Committees, members of the Engineering and of the Glass Committees were included.

The members of the Joint Committee are: Mr. A. P. Trotter (Chairman), Sir Maurice Fitzmaurice and Mr. J. S. Highfield (representing the Standing Committee on Engineering), Prof. H. Jackson, Prof. C. V. Boys (representing the Standing Committee on Glass and Optical Instruments), Mr. C. Carpenter, D.Sc. (South Metropolitan Gas Company), Mr. Leon Gaster (Illuminating Engineer), Mr. F. W. Goodenough (Chairman of the Council of the Illuminating Engineering Society), Captain J. H. Parsons, F.R.C.S. (Ophthalmic Surgeon), and Sir John Snell (Electrical Engineer). The Committee has held its first meeting; the general procedure was discussed; and steps were taken to proceed with inquiries about those problems demanding urgent attention. For the moment it may be necessary to proceed first with investigations of national or immediate industrial value; but after the war, when the work of the Joint Committee will have developed, the range of subjects dealt with can be enlarged.

Allusion was next made to the general events of the year which immediately bear upon the work of the Society; and in the concluding part it was stated that the experience of the past year has served to emphasize even more strongly the desirability of securing additional funds in order to enable the work of the Society to be carried on in a satisfactory manner. During the present circumstances, the Council are unwilling to recommend any radical departure in this respect; but it is becoming evident that, in the near future, the Society must either secure a considerably enlarged membership or increase its present moderate subscription to £2 2s., or, on the other hand, obtain substantial support from such institutions as benefit directly from the movement.

The CHAIRMAN moved the adoption of the report, and commented on its main features.

The PRESIDENT-ELECT (Mr. A. P. Trotter), in seconding, remarked that the year had been an abnormal one for scientific work; and it had been rather surprising that some scientific societies had held together. Work, however, had been done; and he thought that, after the war, the scientific societies of the country would have quite an interesting crop of papers describing the researches that had been carried out by them on behalf of Government Departments for the purposes of the war. Regarding the appointment of the Joint Committee on Illuminating Engineering in connection with the Department of Scientific and Industrial Research, it was impossible to say to what this would lead. But it appeared the most interesting developments would take place. The Society had been called upon to represent a most important section before the Department, because though it had an engineering and a glass section, it had previously no gas or electric lighting section.

The report was unanimously adopted.

VOTES OF THANKS.

Votes of thanks were passed to the President (Sir William Bennett), the Chairman (Mr. F. W. Goodenough), and members of the Council and other office bearers, as well as to the Council of the Royal Society of Arts.

THE NEW PRESIDENT.

The CHAIRMAN announced that Mr. Trotter had accepted the office of President for the ensuing year. No words were needed from him (Mr. Goodenough) to commend Mr. Trotter as their President. They had in him a great authority upon illumination, and particularly upon the measurement of illumination; and they would have the peculiar advantage of having him as their President at the time he was Chairman of the Joint Committee on Illuminating Engineering.

The HON. SECRETARY wished to associate himself with the remarks of Mr. Goodenough. They looked forward with pleasure to the work of the Society under the auspices of Mr. Trotter as President.

Mr. TROTTER thanked the members for their confidence.

ECONOMIES IN LIGHTING IN RELATION TO FUEL SAVING.

With the PRESIDENT-ELECT in the chair, the members then had a discussion on this subject. A report will be found in another part of the "JOURNAL."

This concluded the meetings for the session; and the members will re-assemble next November.

Institution of Civil Engineers' Annual Report.

In their report for 1916-17 the Council of the Institution of Civil Engineers record that 2495 members have entered the naval or military services, and 164 have lost their lives in their country's cause. The Council have decided that, in the interests of engineering, after Jan. 1, 1919, some acquaintance with one foreign language will be required as a condition of election to associate membership. A feature of the past year has been the holding of lectures, as distinct from the usual papers, upon economic and industrial subjects. One of these lectures we notice in our columns this week, on "The Decimal System of Coinage, Weights, and Measures." In this connection it is of interest to state that the Council have supported by a grant of £500 the action of the Engineering Standards Committee in the translation of their specifications into certain foreign languages, and the addition of metric equivalents to the dimensions and measures. The Institution library now consists of 48,497 volumes; and the catalogue, in course of completion, will consist of eleven volumes. It has been frequently used for research work by the Admiralty, War Office, and Munition Departments.

Gas from Coal and Peat Mixed.—It is reported that at a large gas-works in Holland the experiment has been tried, with excellent results, of mixing peat and coal. The quality of the gas is "satisfactory, and a considerable saving of coal is effected." The charge for the retorts is made up of two parts by weight of coal and one part of peat. The peat is entirely consumed; there are no bye-products. It was found that if peat alone was used, the retorts became over-heated, because of the steam resulting from the moisture always present in peat.

WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.

Half-Yearly Meeting at Merthyr.

Last Wednesday, there was a well-attended meeting of the Institution at Merthyr Tydfil—the home of the President, Mr. J. E. Kenshole. Some six years have elapsed since the Institution last met in the town; but though many things have altered in the meantime, the visitors found that in one notable respect there was no change—that is, in the cordiality of the welcome which awaited them. The meeting found plenty to discuss in the two papers submitted and other matters which were introduced; but, at the same time, much of the success of the day's proceedings was attributable to the efforts of the Chairman and Directors of the Gas Company and Mr. Kenshole, their Engineer.

The Business Meeting was held in the Bush Hotel—Mr. J. E. Kenshole, of Merthyr (the President), in the chair.

Minutes of the Last Meeting.—Apologies.

The Hon. Secretary (Mr. Octavius Thomas, of Pentre) opened the proceedings by reading the minutes of the meeting held last September at Aberdare; and they were confirmed.

He then read a number of apologies for absence—among them being letters from Mr. H. F. W. Harries (the Chairman of the Merthyr Gas Company), Mr. A. E. Broadberry (the President of the Institution of Gas Engineers), and Mr. Thomas Canning (of Newport).

New Member.

Mr. H. Langley Bateman, Assistant Engineer and Manager to the Merthyr Tydfil Gas Company, was elected a member, on the proposition of Mr. G. Mayne (Penrhiwceiber).

Annual Report and Accounts.

The Council presented their twelfth annual report, which stated that during the year three members have joined the Institution, and one has died—leaving the number at the end of the year seventy members and two students. The receipts for the year amounted to £37 11s., and the payments to £36 5s. 7d.—leaving, with the balance of £35 16s. 9d. brought forward from last year, the sum of £37 2s. 2d. in the hands of the Treasurer.

Messrs. D. J. Branson, E. H. Clarry, G. S. Davies, H. D. Hazell (members), and H. G. Horwood (student) have joined the Colours. A copy of the "Reports of District Associations for 1916" has been sent to all members who have paid their subscriptions.

The report and accounts were adopted by the meeting.

The Next President.

The President said the next business was to elect a President for the ensuing year. Mr. A. J. Ward, of Cardiff, as Senior Vice-President, should have come forward to the chair; but he did not see his way clear to accept the position on the present occasion. For this fact they were all heartily sorry, as they were convinced that he would have made an excellent President. However, he was remaining as one of the Vice-Presidents, and so probably they would have him as President for the year after next. Mr. Ward not accepting the presidency now, it became his duty, as it certainly was his pleasure, to propose for the position the Junior Vice-President—Mr. J. Mogford, of Briton Ferry. They all knew Mr. Mogford, who had always been willing to do what he could to make the meetings a success. He would be a first-class President.

Mr. A. J. Ward (Cardiff), in seconding the proposition, said it was with great reluctance that he himself had declined to accept office just now; but for business reasons he had thought it better to do so.

The resolution having been carried with applause,

Mr. Mogford returned thanks—pointing out that he had looked forward to being Vice-President for another year. In present circumstances, however, he would do the best he could for the Institution.

Other Officers.

Proposed by the President, and seconded by the Hon. Secretary, Mr. Reginald G. Clarry, of Swansea, was elected Vice-President.

Messrs. J. A. Boucher, S. Murray, and H. Barker were elected members of the Council, on the motion of Mr. J. Robb (Chepstow), seconded by Mr. R. A. Browning (Neath).

Thereafter Mr. Henry Morley was re-appointed Hon. Treasurer, and Mr. Octavius Thomas Hon. Secretary; Messrs. Evan Rees and G. S. Davies being elected Hon. Auditors.

Contribution to the Institution Benevolent Fund.

On the suggestion of the President, it was decided to contribute the usual sum of two guineas to the Benevolent Fund of the Institution of Gas Engineers.

South Wales Coal Comparisons.

The President said that, before proceeding to the papers, he would call upon Mr. R. G. Clarry, who had something which he wished to bring forward. It was rather an important matter.

Mr. R. G. Clarry (Swansea) said he would, with the permission of the President, like to draw the attention of the meeting to a matter which might shortly assume importance to practically the whole of the members. He referred to the poorer classes of gas coal which they obtained in South Wales as compared with the Midlands or Northern districts. This disability they had, of course, always been aware of; but war conditions were tending to bring in legislation of a general character or orders applicable to the whole of the country, and in consequence might press unduly on gas undertakings that used a large proportion of South Wales coal. The new calorific standard of 500 B.Th.U. gross, which was regarded as general throughout the country, might be taken as an instance. While this figure might leave scope in other parts of the country, to them in South Wales there was practically no margin after oil-washing; and consequently, to make South Wales comparable with the rest of the country, and to be equally just with them, the South Wales standard should be at least 25 B.Th.U. gross less than 500. Exactly how much less would no doubt be ascertained in due course, after some experience of working to the calorific standard. Incidentally, in general terms, the benzol recovered per ton of coal from South Wales coal was necessarily very much lower than the quantity that was obtainable from coal in ordinary use throughout Great Britain. Again, from Mr. Glover's remarks at a recent meeting of the Eastern Counties Gas Managers' Association, it was possible that the coal requirements of certain gas undertakings might be cut down, and that they would then be requested to use a proportion of blue water gas, where the necessary plants were available, to make good the reduction. In this regard, as much as 25 p.ct. of blue water gas had been suggested. He would be glad to hear the opinions of members as to what percentage could be added, while maintaining the calorific standard of 500 B.Th.U. At Swansea, they were carrying out experiments at the present time; and, as far as their opinion went, he did not believe that they could add more than 5 p.ct. of blue water gas, if as much. It was very important, in this connection, that their inability to add blue water gas was not due to adulteration or over-exhausting, or any of the other means of increasing the bulk and the quantity of inert constituents at the same time. There was also a very natural tendency to make general comparisons in the price of gas; and when comparing South Wales with other districts, the fact was often lost sight of that there they had to pay at least 2s. 6d. per ton more for their coal, the best of which would compare unfavourably with the average Midland gas coal. This increase in price was due at the present time to the addition to the standard amount in the Price of Coal Limitation Act; but large quantities of bituminous coal would no doubt be exported from South Wales after the war, and tend to at least maintain the inflated price. This brought them to another question of the growing scarcity of suitable gas coal even of the poorer quality in South Wales, which was an important factor they would have to reckon with in a few years' time. The difficulty might be overcome by making some restriction on the export trade of bituminous coal from South Wales until the coal required for home consumption had been satisfied. The latter proposal was one for adjustment in "after the war" trade conditions; but with regard to the other points enumerated, he suggested, if the members considered them of sufficient importance, that a resolution should be forwarded to the National Gas Council, officially pointing out the discrepancy in the quality of the coal used in South Wales and the price paid for it, and asking that due consideration be given, and allowance made, in these respects in comparing results or dealing with any general instructions issued to the gas industry.

The President said he was sure they were very much obliged to Mr. Clarry for bringing this subject forward. It was a matter which was of considerable importance to them all, and it had been introduced so that they could get an expression of opinion from the members. It was quite true that the quantity of benzol and toluol obtained was lower from the South Wales coals than from the better class coals of the Midlands and the North. They were doing their best; and more than this it was impossible to do. What was not in the coal, they could not get out of it. With regard to the calorific value, it was to be hoped that something might be done. So far as he was aware, there was only one Act (at all events anywhere in the near neighbourhood) where they had a lower calorific standard than 500 B.Th.U. This was Porthcawl, where he believed they had a standard of 475 B.Th.U. He knew that efforts had been made in connection with some of the more recent Bills; and the Lord Chairman had distinctly said they would not consider anything less than 500 B.Th.U. Well, this might be due to the facts not having been put forward before. It was pointed out that Porthcawl had a lower standard; but the Lord Chairman said this was quite an error which had crept into the Bill. There were one or two members who could say something as to what they had been doing in this respect.

Mr. A. E. Davey (Aberdare) said the question was certainly one which had an important bearing upon their business. With regard to the foremost point which Mr. Clarry had raised, they felt very strongly the fact that the 500 B.Th.U. standard was rather harsh to South Wales gas undertakings; and in his Company's recent Bill in Parliament, they asked for a standard of 475 B.Th.U. They gave as their reasons the nature and the quality of the coals that they had to deal with in South Wales—the coals which were the easiest obtainable, and which they could get at a price at all comparable with the price paid in other districts. He appeared before the Lord Chairman in connection with the Bill, and these points were strongly put before him. He, however, seemed quite adamant in his view that the 500 B.Th.U. was regarded by them as being quite as low a standard as they could pass; and he immediately put his blue pencil through the request that had been made. He admitted that the lower figure had been granted in one other case (that of Porthcawl), for the very reason his own Company had put forward—the quality of the coal they had to deal with. But nevertheless he quite passed over the arguments. In reference to the quality of their coal, he (Mr. Davey) had often wondered whether it would be possible for them to get some coal from a distance by coming to a sort of joint arrangement. Of course, he knew that the small concerns could not take a sufficient quantity to enable them to go to the shippers and say they could do with a boat of 2000 tons, because it

would be too much for them to deal with in the matter of discharging; but he had it in his mind that an arrangement might perhaps be made with a firm of shippers—it had been done in certain directions in the past—by which they could combine to get a boat-load of this size, and distribute it among the various gas undertakings. They might get Lancashire or North Staffordshire coals, which would be a great help to them. The coal could be shipped (say) at Garston by the boats which went to feed the liners. There was a firm at Cardiff who did this particular business. They went loaded from Penarth to Garston or Birkenhead, and discharged, and then came back light, unless there was a freight arranged in the manner he had suggested. If they could, through the medium of their Institution or a Committee, secure a cargo of this sort and distribute it, thus getting an occasional 500 tons of this better coal into their works, it would assist them considerably in their general working. The matters brought forward by Mr. Clarry be quite agreed with; and they were well worthy of consideration.

Mr. J. ROBB (Chepstow) thought the suggestion made by Mr. Davey would defeat the very object for which Mr. Clarry had contended. He would find the argument used against him. Personally, he (Mr. Robb) was very much interested in the points that had been raised, because his Company were going to Parliament with a Bill. There was one matter Mr. Clarry had not made strong enough, and that was in reference to the cost of the coal. Besides having to pay 2s. 6d. more on the controlled price than other parts, in normal times, over and above the inferiority of quality, the prices were from 2s. 6d. to 4s. more than those in other portions of the kingdom. In any comparison of prices, this point ought to be very much impressed upon the National Gas Council and the Board of Trade.

The PRESIDENT: You will be able to put that forward when you are going for your Act.

Mr. W. C. JACKSON (Neath) said he was glad Mr. Clarry had brought this matter forward. He (the speaker) had passed through a very trying winter; and it was only after he had got his new carburetted water-gas plant to work in the early part of March, that his troubles ended. It might be of interest to them to know what he was doing with this plant. He had arranged the plant so as to work direct from the relief holder into the foul main at a point close to the settings; and when he first started-up he expected to get down to at least 2 gallons per 1000 c.ft. by this method. To his surprise, he was able to considerably reduce this quantity, and was now working 0·6 gallon per 1000 c.ft.; and the gas showed on test to be 499·9 B.Th.U., working a percentage of 15 to 20. Quite recently, he had a setting down for repairs, and worked up to 25 p.ct.; and apart from a few complaints as to cookers lighting-back, he got through quite nicely. He could with safety recommend working a 15 p.ct. mixture. With regard to obtaining supplies of coal by water, while he was at Waterford this was a regular thing; the different gas-works in that neighbourhood waiting to charter a steamer to bring across cargoes in the manner suggested by Mr. Davey.

Mr. A. G. LOFTHOUSE (Treharris) remarked that if they mixed about 15 p.ct. of water gas, they had to be prepared to sacrifice a lot of the yield of coal gas per ton. This was about the maximum he had mixed; and it was necessary to watch matters very carefully then. With some coals, they could not mix water gas with the coal gas; while with others they could mix 15 p.ct., and be on the safe side.

Mr. J. MOGFORD (Briton Ferry) thought the proposal brought forward by Mr. Clarry was bound sooner or later to affect the whole of them seriously. The point to him was that, if the standard for South Wales was fixed at 500 B.Th.U., the same as for the rest of the country, they would always be compelled, as had been the case hitherto, to sell gas at a higher rate than other parts. The local bituminous coals were few and far inferior to what were known as gas coals in the Midlands and in Yorkshire; and, although inferior, the price, as had already been mentioned, had always been higher than that of the other coals referred to. To his mind, this was due to the price of Welsh steam coal. Everyone knew that Welsh steam coal commanded its own price at all times; and he thought this was the reason that the local bituminous coals were dearer than Midland and Yorkshire coals. Though there were now very few collieries working bituminous coal, they were likely in the future to get still less than they had had in the past. As most of those present knew, there were coke-oven plants being put down in connection with almost every bituminous coal colliery. These plants would take very considerable quantities of coal, and therefore leave them with a smaller market for their requirements. Regarding the suggestion of Mr. Davey, that they should have a co-operative system of buying coal, he hardly thought this was going to help from the national point of view. Recently he had had to deal with a circular the object of which was to avoid carriage of coal and other commodities, so as to relieve the railways. This meant that, for the duration of the war at all events, they would be confined to their local coals. Seaborne coal was out of the question; and therefore he was afraid they would be entirely confined to South Wales coal. Personally, he was of opinion that, from an economical point of view, it was better in the long run to use a proved local coal. It enabled them to sell as satisfactory a gas as could be obtained from South Wales coal at a reasonable price. It helped from the national point of view, inasmuch as they were not congesting the railways or calling for shipping which was getting scarce. He had had no experience as to whether 500 B.Th.U. was too high for a reasonable supply of gas from South Wales coals; but he would suggest that, if they did not come to the conclusion that it would be best to pass a resolution at this meeting, they might at least keep the matter in mind, and try and hold things over so as to get evidence as to how the supplying of gas of 475 B.Th.U. worked out. If they could collect evidence that such gas produced satisfactory results in Porthcawl, they would have a very strong case for securing for South Wales treatment different from the rest of the country.

Mr. EVAN REES (Margam) said the matter was one of undoubted importance, inasmuch as the question of coal for South Wales gas undertakings had always been a very vexed one. As a matter of fact, the prices paid in South Wales for South Wales coals had really been entirely out of proportion to their value, as far as gas producing was concerned. The price paid for coal had a very important bearing on the calorific value of coal gas, or the matter of setting-up a standard. But the question on which he would like to have some information was that of efficiency. Having due regard for the efficiency demanded of gas suppliers by the public, what, in the opinion of Mr. Clarry or any other members, would be the result of the lowering of the standard to 475 B.Th.U.? As gas suppliers, they must always bear in mind that the public required the most efficient service. If they were going to depreciate the value of their service, then they would have the public up against them. It was essential that, in discussing calorific values, they should keep an eye on the people who were using the gas. Efficiency was all-important in these days.

The PRESIDENT, alluding to Mr. Davey's suggestion for taking combined action to get cargoes of coal round, said he recollected that some twelve or fourteen years ago he negotiated with the owners of boats running from Garston to Cardiff, to see what it would cost him to get North Country coals into his district; and to his surprise, the cost of loading at Garston, with the freight round, and the unloading at Penarth Dock, was less than the Taff Vale Railway Company wanted to bring the coal from Cardiff to Merthyr. Adding the two sums together put the proposition entirely out of court; but more particularly it was the carriage from Cardiff by rail that killed it. He would now call upon Mr. Clarry to move a resolution.

Mr. CLARRY said he would first like to deal with one or two of the points that had been raised in the discussion. By importing Midland or Yorkshire coal into their district to any large extent, they would be defeating the object he had in view. They would be putting themselves entirely on a par with the undertakings using this coal, and would not be able to ask for any different treatment. At the same time, they would have to pay all the extra cost, which would amount to at least 7s. or 8s. per ton. This was a point that should be borne in mind. As to the mixture of water gas, it varied with the quality of coal. Mr. Glover was now advising the Coal Controller; and apparently he was going to advise him that all gas undertakings using oil washing could afford to put in 25 p.ct. of water gas, and still get 500 B.Th.U., and reduce their coal requirements accordingly. If this was applied to those oil-washing in South Wales, it would inflict on them considerable hardship. They could not put in 25 p.ct. regularly. As to the standard of 475 B.Th.U., of course, he merely mentioned this. It was perhaps a mistake to name any particular figure; but the standard which seemed to be recognized was 500 B.Th.U., and he took a proportion which he thought would be just in comparison with it. The figure was only intended to be proportionate. Assuming it was 500 B.Th.U. for the country generally, it would be proportionately less for South Wales. If it was 550 B.Th.U. for other parts, it would be much less for South Wales. The country had not really adopted 500 B.Th.U. yet. This was why the period of five years was attached to the Orders. What they wanted was to have some distinction drawn for their benefit. The following resolution had been drafted; and he moved its adoption:

THE RESOLUTION.

> That the attention of the National Gas Council and the Institution of Gas Engineers be drawn to the poor quality of gas coal obtainable in South Wales and Monmouthshire, as compared with the Midland and Northern districts; and in addition the gas undertakings of this district have to pay 2s. 6d. per ton more for their coal under the Price of Coal Limitation Act.
>
> In view of the above facts, this meeting desires the National Gas Council to give due consideration and allowance to South Wales in comparing results or dealing with any general instructions to be issued to the gas industry, more particularly in reference to the calorific standard and the use of blue water gas, as suggested, as a means of reducing the consumption of coal.

Mr. DAVEY seconded the resolution, which was agreed to.

MINISTRY OF MUNITIONS AND AMMONIA RECOVERY.

Mr. J. H. CANNING (Newport) remarked that, with the permission of the President, he would like to make a statement to the members with regard to the question of ammonia recovery. It was that the Ministry of Munitions had asked that a special appeal should be made to all gas undertakings, in the first place to recover the maximum amount of ammonia from the gas. This was exceedingly important in the national interest. Not only for fertilizers, but also for the manufacture of certain explosives, it was essential that all ammonia should be abstracted. In the second place, the appeal was that as far as possible all loss of ammonia by evaporation from tanks or exposure to the air should be avoided. In this connection, they would remember that attention had been drawn in the last report of the Alkali Works Inspector to the value of covering the surface of liquor in all storage wells and supply tanks with a thin film of oil. It had been found that exposure to the air alone might produce a loss of as much as 30 p.ct. Further, the liquor, as far as possible, should not be allowed to drop from a height into the tank. The delivery pipes as well as the suction pipes should be slightly submerged beneath the surface.

THE PAPERS.

Mr. W. C. JACKSON (Neath) then read a paper on "Coal Gas a Substitute for Petrol on Commercial Motors;" and Mr. J. MOGFORD (Briton Ferry) one entitled "Sulphate of Ammonia for Allotments." The latter paper appears on another page of this week's issue; the former will be published later on. At the conclusion of the discussions,

Mr. EVAN REES proposed a hearty vote of thanks to the authors for their interesting and suggestive papers. In both there were pointed out directions for further investigation, which he had no doubt the members would take up.

Mr. S. MURRAY (Aberkenfig) seconded, remarking that he was Vice-President of an Allotment Association, and found that most allotment holders knew absolutely nothing about sulphate. Another thing was that the experts generally appointed were men who had not handled much sulphate.

The resolution was cordially passed by the meeting.

THE LIST OF PROTECTED OCCUPATIONS.

The HON. SECRETARY said there was one other point he would like to raise, and it was in connection with the List of Protected Occupations. He thought they should take steps, along with the other District Associa-

tions, to see if they could not get all gas-works certified. They were doing a large amount of work necessary for the preparation of high explosives; and he did not think there should be any question about the matter. He proposed:

> That the attention of the National Gas Council be drawn to the fact that in the Schedule of Protected Occupations just issued only those gas undertakings that are "certified" have any protection for their men, who are necessary to carry on the manufacture and distribution of gas.
>
> Nearly the whole of the gas undertakings in England and Wales are either oil or tar washing their gas at considerable expense, to produce as much material required for high explosives as possible; and this meeting of the members of the Wales and Monmouthshire District Institution of Gas Engineers and Managers is unanimously of the opinion that the same protection should be given to the men employed in all gas-works, whether "certified" or not, and therefore calls upon the National Gas Council to take the necessary steps to obtain the inclusion of all gas undertakings in the schedule.

Mr. R. G. Clarry seconded this, and it was unanimously passed.

Thanks to the Gas Company.

Mr. T. H. Hazell (Newport) said they had had a very good meeting; the subjects dealt with having been of importance, not only to their own industry, but they might fairly say to the nation at large. Their thanks were due to the Chairman and Directors of the Gas Company, who had invited them to meet at Merthyr Tydfil, and in that room. He proposed a hearty vote of thanks to them for this, and for their hospitality.

Mr. R. A. Browning (Neath), in seconding the proposition (which was cordially agreed to), remarked that they owed a great deal to the Directors of the Gas Company.

Place of Next Meeting.

On the suggestion of Mr. Mogford, it was agreed that the place of next meeting should be left to the Council to decide.

The President said that this concluded the business; and he was much obliged to all those who had attended the meeting.

Lunch and the Gas-Works.

The party of about fifty then had luncheon in the Bush Hotel, at which they were the guests of the Chairman and Directors of the Merthyr Tydfil Gas Company. Dr. T. W. Scale was in the chair, and proposed the Loyal Toast and "The Wales and Monmouthshire District Institution of Gas Engineers and Managers," which was responded to by the President. "The Merthyr Tydfil Gas Company" was submitted by Mr. Hazell, and replied to by Mr. V. H. Thomas (another Director).

In the afternoon the members inspected, under the guidance of Mr. Kenshole, the new works which were built some few years ago, and which were described in a paper read by him on the occasion of the previous visit of the Institution to Merthyr, in September, 1911. The works stand on an area of about 7 acres; so that there is plenty of room for extensions when these are called for—or, more properly speaking, when it is practicable to carry them out. As a matter of fact, drawings were out for extending the retort-house at the time the war broke out. Since then, the Gas Company have been feeling the effects of the abnormal conditions; but still, as Mr. Kenshole pointed out, there is no lower charge for gas in Wales than at Merthyr and Wrexham. As to the influence of the war on consumption, it may be stated that in 1914 the output was nearly 146,000,000 cubic feet; the increase in sales during the first half of that year being at the rate of over 20 p.ct. per annum—more than in any other full year since the inauguration of the Company. Directly the war started, however, there was a change; and last year the sales had gone down to 132 millions. To mention one cause, there are now only some 60 or 70 public lamps in lighting, out of between 600 and 700.

With regard to the works themselves (which are connected by sidings with the Taff Vale Railway), they are, of course, of modern design; and there are no superfluous buildings about them. The retort-house contains eight settings of six through retorts, 25 in. × 16 in. × 18 ft. long. They are charged and discharged by a Fiddes-Aldridge simultaneous machine. The coke is discharged into skips placed underneath the retorts, and is conveyed by a Strachan and Henshaw telpher to a quenching tank, and from there to the railway-wagons or deposited on the yard, as desired. This telpher plant has been installed since the last visit of the Institution. The coal is broken and elevated into hoppers which contain 24 hours' supply, and are continuous along the top of the retort-house. In connection with the bench, there are a tar-tower and a retort-house governor.

The condensers are of the water-tube type. In the engine-house are to be found a battery of gauges, two engines and exhausters by the Bryan Donkin Company, of 15,000 c.ft. per hour and 40,000 c.ft. per hour capacity respectively (one for the summer and the other for the winter make), and a gas-engine and dynamo for generating the current for the charging and telpher machines. The washer-house contains a tar-washer and a rotary washer by Messrs. Kirkham, Hulett, and Chandler, as well as a second rotary washer of the brush type by Messrs. W. C. Holmes & Co. The quantity of liquor produced per ton of coal carbonized is equal to 24 gallons of 10-oz. strength. The boilers are in duplicate, 30 ft. × 6 ft. Lancashire type, fitted with Meldrum forced-draught furnaces for burning breeze. Coming to the carburetted water-gas house, the pumps and blowers are driven by De Laval steam turbines; and space has been provided for duplicating when necessary the existing Humphreys and Glasgow water-gas plant of 300,000 c.ft. capacity.

Purification is carried out by a set of four 25 ft. × 20 ft. × 5 ft. purifiers with water-lutes, and one 25 ft. × 20 ft. × 5 ft. catch-box of the luteless type. There is ample space for revivifying. The Braddock station-meter is of 50,000 c.ft. per hour capacity; and two Parkinson and Cowan station-governors (one 18-in. and the other 12-in.) regulate the pressure to the upper and lower districts respectively. In addition to the offices, there are on the works a photometer-room and laboratory. Storage is provided by two spiral-guided holders, one of 600,000 c.ft. and the other of 400,000 c.ft. capacity.

Besides the telpher installation, the plant put down since the last visit is the 1,000,000 c.ft. rotary washer, the 400,000 c.ft. holder, and the 25 ft. × 20 ft. × 5 ft. catch purifier.

TOLUENE EXTRACTION.

By H. C. Applebee.

[A Paper read before the Manchester and District Junior Gas Association.]

It is not without some feelings of diffidence that I venture to offer this paper to the Association. Much of the information it contains is common knowledge; but in the belief that such a paper as this may stimulate interest and pave the way for helpful discussion, I ask your attention to the subject of toluene extraction.

I have chosen to treat of the general topic on two grounds—first, that the information at my disposal is general rather than confined to any particular point; and, second, that the interest of this Association will be general also. Much of the information contained in the paper is incomplete—at least, in the sense that it gives rise to suggestions and possibilities which I have had neither time nor opportunity to develop.

Few of us realized at the outbreak of the war what an important part in its successful prosecution would fall to the lot of the gas industry. Among the possible sources of benzol and toluol, coal gas and, to a lesser extent, carburetted water gas, take an important place. When one considers that, per ton of coal carbonized, the resulting tar yields roughly from ½ to ¾ gallon of benzol, and from 1-10th to ¼ gallon of toluol, while the gas contains from 1 gallon to 2½ gallons of benzol and ½ to ⅔ gallon or even more of toluol, the importance of the treatment of the gas itself will be evident. As a matter of fact, the bulk of this country's pre-war supply of coal-tar hydrocarbons came from the coke-oven industry; but the possible output from the treatment of the gas produced on gas-works proper far exceeds the output from coke-oven works. Once these facts were grasped, suggestions for the removal of these valuable constituents were not lacking. Most of those present will have had some experience of one or another of the methods proposed. Attention need only be given to the following:

The "C" Process.

In the "C" (Metro.) process, the essential point consists in the washing of the gas by coal tar itself, or carburetted water-gas tar. The gas is passed through convenient forms of washers or scrubbers, and is so brought into contact with the tar. The theory was that the tar, so to speak, dissolved or absorbed the naphthas from the gas, thus greatly increasing the percentage contained in the original tar. I cannot pretend to any practical experience of this method. One may, however, say with safety that the results did not always fulfil expectations; the cause being probably found in the difficulty of attaining the ideal conditions, or even in the lack of knowledge on the part of those in charge as to what were the proper conditions. While the results in some cases appear to have been satisfactory, one has heard the statement that in some other cases benzol and toluol were extracted from the tar, instead of from the gas.

Oil Scrubbing.

The oil-scrubbing processes have undoubtedly proved the more satisfactory. Essentially these follow the lines of coke-oven practice. The main points are as follows: The gas is passed through suitable scrubbing or washing apparatus, and is there brought into intimate contact with some absorbent oil which removes the benzol, toluol, and solvent naphtha. The resulting oil is then distilled; the naphthas removed; and the oil returned for further use. The variations of the process lie in the form of washer or scrubber, and in the particular absorbing oil used. The ordinary types of apparatus found in gas-works have been pressed into service. Centrifugal washers are being used, it is claimed, with more success than any other form. At the Bradford Road works of the Manchester Corporation, with which I am associated, the scrubbing is effected—as I shall describe later in more detail—by towers packed with wood laths down which the oil flows, and up which the gas is passed. The method has proved decidedly satisfactory.

The Most Suitable Oil.

There arises at once the important consideration of the most suitable absorbing oil. Petroleum and the various grades of coal

tar creosotes and anthracene oil have all the property of absorbing naphthas. Experiments were made on a small scale at Bradford Road with both petroleum (ordinary gas oil being used) and ordinary coal-tar creosote. The results obtained suggested that creosote would prove the more suitable medium. Moreover, gas oil presents certain difficulties in the subsequent recovery of the extracted products; so that it may be safely assumed that some grade of coal-tar oil is the more suitable. As to the grade of oil, opinions vary somewhat. It seems to me that the main conditions are:

1.—That the oil shall not contain any large amount of naphthalene or other solid hydrocarbon, in which event there is the risk of blocking the apparatus in cold weather, and the further possibility of carrying forward naphthalene and its subsequent deposition in the mains.

2.—The specific gravity of the oil should be conveniently over 1·00. Creosotes, it may be remarked, are sometimes mixed with other oils, such as shale oil or blast-furnace oil, which, while they may prevent the deposition of naphthalene, may also lower the specific gravity to an objectionable degree. The objection to oils of lower specific gravity than 1·00 lies largely in the subsequent recovery of the naphthalene. As we shall see, this is commonly effected by steam-heated stills, and difficulty has been experienced in such cases when the necessary open steam is introduced.

3.—The heat economy of the plant is a serious consideration, so that the specific heat of the oil should not be too high.

At Bradford Road, the wash-oil in use is a creosote of specific gravity (when fresh) of about 1·02, commencing to distil at about 205° C., and giving about 80 p.ct. at 200° C. It contains only a small proportion of naphthalene. Coming, now, to the effect of the removal of the naphthas from the gas, the most obvious will be that on the illuminating power. The following results obtained on a small experimental scale at Bradford Road may be of interest. A small tower was constructed roughly in the proportions of those proposed (at that time) to be erected on the plant. This was packed with small pieces of coke, and had, of course, convenient arrangements for the inlet and outlet of gas and oil. The gas was made to pass from a 10 c.ft. holder upwards through the tower into a second holder. Each holder being connected with the photometer, it was possible to obtain the candle power both before and after treatment. Necessary corrections were made to eliminate the various sources of error; typical results being as follows:

— —	Initial C.P.	Final.	Reduction.
Oil used, 231 gallons per 1000 c.ft.	17·0	11·8	5·2
,, 924 ,, ,, ,,	17·2	8·6	8·6
,, 4480 ,, ,, ,,	17·2	10·0	7·2
,, 6754 ,, ,, ,,	17·3	10·1	7 2
,, 7436 ,, ,, ,,	16·3	9·9	6·4

These results would suggest that there is a point of maximum reduction, and that, on the scale of these experiments, this point is reached at about 924 gallons per 10,000 c.ft. The amounts of wash-oil employed in these experiments is far in excess of those used in practice, and, owing to the different conditions, are not strictly comparable.

In a further series of experiments, the stream of gas leaving the scrubber was taken direct to the photometer. In this way, it was possible to take readings at regular intervals; thus eliminating certain possible objections and sources of possible error in the previous method. The results, however, were not widely different to those given. An attempt was made to remove all the illuminating constituents; the lowest result obtained being about 5 candles. The effect on the calorific value was not so marked. At the time of the above experiments, it was not practicable to test the calorific value directly; but by calculation from analyses of the gas, the reduction indicated was about 6 to 8 p.ct., according to the reduction in candle power.

As to the quantity of naphtha removed, the above experiments were not specially undertaken to determine this point; but the results suggested that about 3 gallons per 10,000 c.ft. might be expected. Other experiments showed a total naphtha content rather higher than this—nearly 4 gallons per 10,000 c.ft. being obtained from coal gas, of which about 0·5 to 0·6 was toluene.

Enrichment.

It was originally suggested that the benzol removed from the gas should be returned to it, either directly by mixing with the wash-oil, or by means of a carburettor. But the subsequent demand for benzol prevented the suggestion from being carried into effect. Definite experiments were made at Bradford Road with a view to determining their suitability, with two grades of petrol—one commencing to distil at 52° C., and being "dry" at 142° C., the other commencing to distil at 100° C., and being dry at 114° C. In both cases evaporation was complete at 100° C.—and even at room temperature—in a stream of the gas. The former spirit gave slightly better results; but neither seemed to be quite so successful as benzol is reputed to be. There appears to be little to choose between various grades of petrol; but it is obvious the lighter the spirit, the less the difficulty of vaporizing, and the less likelihood there is of any subsequent deposition in the mains.

Turning to the practical issues. Since many of the members have had an opportunity of seeing the plant at Bradford Road, a brief description of the various parts will suffice. Taking each part in turn, we come first to the

Scrubbers.

After leaving the purifiers, the gas is led through tower scrubbers, each of which is 55 ft. high and 7 ft. 6 in. diameter, and of which there are six. These are in three pairs, so arranged that they can be worked in two sets of three each, each of the three being arranged with bye-passes which will cut out any or all of them. Commonly the scrubbers are worked in two sets of three each; the stream of gas being divided. The wash-oil enters the system at the top of the last pair, finds its way to the seal-pots at the bottom, and thence overflows to the seal-pots of the second pair. From these it is circulated (by pumping) through the second pair; the overflow passing on to the first pair of seal-pots, from which it is circulated through the first pair of towers, where the gas enters. The oil overflows from the first pair of seal-pots and runs to the rich-oil well. Thus gas and oil travel in opposite directions; the fresh oil being the last to meet the gas.

It is evident that many conditions will affect the amount of products recovered from the gas. Those principally concerned will be: (1) The amount of wash-oil used; (2) the quality of the oil; (3) the temperature of the oil and of the gas; (4) the circulation of the oil; (5) the "mechanical" efficiency of the scrubbers (including such items as their packing, number in use, &c.).

There is evidently a practical limit to the amount of wash-oil which can be used; and the cost of dealing with excessive quantities of rich oil would outweigh the possible slight advantage which might be gained. At Bradford Road the amount of wash-oil used has varied from 70 to 105 gallons per ton of coal carbonized; and it is usually considered that from 60 to 70 gallons are necessary for efficient scrubbing. We have obtained our best results using 105 gallons; and reductions of the amount of wash-oil to amounts below 70 gallons to the ton have invariably led to reductions in the amount of crude benzol recovered. As to quality, the oil in use has already been described. This, however, suffers deterioration by reason of the fact that, in the subsequent recovery of the crude benzol, part of the creosote is lost (amounting to about 20 p.ct. of the crude benzol recovered). As a consequence, the specific gravity of the oil gradually rises, and the distilling points become higher, until a point is reached when it becomes advisable to change the oil. It is considered advisable to do so when the specific gravity reaches 1·06 to 1·065, or the distillation shows less than 50 p.ct at 300° C.

Just as in the "C" process temperature is an all-important factor, so here it is advisable to keep the temperature of both oil and gas as low as possible. Any appreciable rise in temperature in the system results in a corresponding decrease in crude benzol production. Normally the oil entering our scrubbers is at about 25° C., at which temperature it is safe to say there is no serious loss.

It is generally found that a suitable degree of saturation of the wash-oil is reached when the oil contains about 3 p.ct. distilling up to 120° C. This point is to some degree regulated by the amount of circulation in the last two pairs of scrubbers, and, of course, by the amount of fresh wash-oil used. One would anticipate that, other things being equal, the larger the circulation the better the efficiency and the higher the degree of saturation. On the other hand, too great a degree of saturation may cause loss owing to the "mechanical" vaporization of the lighter constituents by the passage of the gas through the oil. Our practice is to pass four or five times the amount of oil down the first and second pair of scrubbers than passes down the last.

As to the packing of the towers, I have little to say. The arrangement will aim, obviously, as in any scrubber, at presenting the largest possible surface to exposure. We have consistently obtained better results by dividing the stream of gas through the two sets of three scrubbers than by passing all the gas through a single set. This is to be expected, since double the surface is available for absorption.

Testing Results.

It is evident that occasional tests should be made to ascertain the efficiency of the scrubbing. There are in common use for this purpose the following methods. First, a convenient quantity of gas is passed through a series—say, three or four—of wash bottles containing creosote or oleic acid; the naphthas being absorbed. The quantity of the latter is then determined by distillation. In the case of creosote, the oil should first be distilled to 200° C.; while the oil from the test is distilled up to 200° C. or, alternatively, a "blank" test may be made with the same creosote; the result being deducted from that obtained in the test proper. In the case of oleic acid, the naphthas are steam distilled from the "enriched" oil. Oleic acid not being volatile in steam, the resulting naphthas directly represent the amount contained in the gas.

We have also successfully applied Dr. Coward's method, which, however, requires special (and costly) apparatus. The method consists essentially in the introduction into a vacuous vessel of a quantity of the gas under examination at atmospheric pressure and temperature. The condensible products (consisting of the naphthas) are then frozen out by a mixture of solid CO_2 and ether; the uncondensed gases being pumped away by means of a mercury vacuum pump. The vessel is then warmed-up to atmospheric temperature, and the pressure noted. The percentage of condensible

products is proportional to the pressures. The amount of naphtha contained in the gases at the inlet and outlet of the scrubbers having been estimated by one or other of these methods, the efficiency of the scrubbers is readily calculated. Our tests have given the following results:

	P.Ct.
With three scrubbers in use and 74 gallons of wash-oil per ton	75 to 78
,, three ,, ,, 108 ,, ,, ,,	82 to 84
,, six ,, ,, 108 ,, ,, ,,	up to 88 p.ct. efficiency.

The decrease in candle power has varied from five to eight candles, according to the wash-oil used. The decrease in calorific value has been less marked, varying from 5 to 7 p.ct., according to the conditions in force at the time.

So far I have spoken only of coal gas; but recently a new departure has been made, and we are now scrubbing carburetted water gas. The coal gas is taken through one set of three scrubbers; the other set being utilized for the carburetted water gas. The whole work is conducted on exactly similar lines to those for coal gas; and the general remarks already made apply equally well.

The amount of crude benzol recovered will naturally depend on the oil used in making the carburetted water gas. We are obtaining about 2·5 to 2·8 gallons of crude benzol per 11,000 c.ft. Unfortunately, we have not been able to secure figures for the reduction in candle power; but indications lead us to anticipate similar results to those obtained with coal gas. The calorific value under the conditions under which we are working—viz., 95 gallons of wash-oil per 11,000 c.ft.—suffers a reduction of about 6 p.ct.

Recovery of Crude Benzol.

The stills used for this purpose are of the continuous type, erected by Messrs. Simon-Carvès, and consist of six parts—the still proper, the heat interchanger, the dephlegmator, the superheater, and two tubular condensers. The rich oil is fed to the still by pumps, and passes, first, to the first condenser, where it helps to cool the vapours leaving the still, and is itself warmed to about 50° C.; second, to the dephlegmator, where it reaches 65° C.; third, to the heat interchanger, where the temperature rises to about 80° C.; fourth, to the superheater, where it is steam heated by closed steam to about 130° C.; fifth, to the still proper, where it is brought into contact with the open steam; and, lastly, through the heat interchanger, and so away to the oil-coolers, which consist of gilled pipes water cooled. The vapours leaving the still proper pass through the dephlegmator, leaving the latter at about 95° to 100° C., passing on to the first condenser (which is cooled by the incoming oil), and finally to the last condenser, which is water-cooled, and where the vapours are finally condensed.

The feed pumps are regulated to work at a set speed; the quality of the crude benzol produced being largely determined by the amount of open steam introduced into the still. This is regulated to give a definitely determined temperature to the vapours between the two condensers. Once this temperature is decided upon and the conditions set, the still works quite regularly, and requires comparatively little attention. It is customary to produce benzol testing 65 p.ct. at 120° C. when distilled from a retort with the thermometer in the liquid; and this practice is followed at Bradford Road.

The crude benzol is next partially fractionated. For this purpose a Dempster still is used, having a capacity of about 3000 gallons. Crude benzol testing 65 p.ct. at 120° C., as above, yields, roughly, 60 p.ct. of once-run benzol and 15 p.ct. of once-run toluol; these amounts varying more or less according to the method of fractionation. The residues (or the "bottoms" as they are termed) which are left in the still after the desired fractions have been distilled off are run into shallow trays, where, on cooling, the naphthalene separates out. The oil which is drained away from the naphthalene, or "creosote salts," is returned to the wash-oil; the naphthalene being a marketable article.

The once-run benzol and once-run toluol are then "washed" separately. The washer employed is of the usual cylindrical type, tapering to a cone at the bottom. Its working capacity is about 2500 gallons, and it is fitted with a belt-driven mechanical agitator. The acid used is sulphuric (concentrated oil of vitriol); its strength being as near 1·84 sp. gr. as possible, and is best added in two portions. Our practice is as follows: Charge to the washer, 2500 gallons. The first acid (five gallons) is agitated for fifteen minutes. This has the effect of removing traces of water, and some of the more basic impurities. After settling for a short time, this acid is drawn off, and the bulk acid (46 gallons) added. This is agitated for forty minutes, and allowed to settle for thirty minutes. The second acid being drawn off, water is run through the charge without agitation to remove the bulk of the remaining acid. This operation is repeated, after which the washer is agitated for ten to fifteen minutes with a further quantity of water—a second agitation with water is given if necessary. Caustic soda solution of about 20° Twaddel is next agitated with the naphtha for from fifteen to twenty minutes. After standing for about thirty minutes, the soda is run off, and the bulk finally agitated with water for a short time.

The loss on washing is estimated at 7 p.ct. This, of course, will vary with different qualities of crude benzol, as will also the amount of acid required to produce a given degree of refinement. Some coal gas will yield a crude benzol containing large quantities of impurities. Consequently, large amounts of acid are necessary, and the loss in washing will be correspondingly high.

It was thought likely that the introduction of crude benzol produced from carburetted water gas would increase the difficulties in washing the once-run products. Happily, our fears have not so far been realized, and the increased loss is comparatively small. After the washing process, the naphtha is run into the final still, where the process of fractionation is carried further. The still is again of the Dempster type, with a capacity of about 3000 gallons. The practice here will vary somewhat, according to the quality of the naphtha to be treated, the type of still used, and the products desired.

Standard benzol to meet the Government requirements should give as little distillate below 80° C. as possible; so it is necessary some times to take off a preliminary fraction (first runnings), consisting of light hydrocarbons, carbon bisulphide, &c. Fortunately, we do not find this necessary, and our first fraction gives standard benzol showing only 3 or 4 p.ct. below 80° C. Commercial toluol should contain 75 p.ct. of toluene (tested by Dr. Colman's method); and we have experienced no difficulty in meeting this requirement.

In all processes of final fractionation there are more or less intermediate fractions, which are put back for re-working; and, as in the preliminary fraction, when all the desired products have been distilled off, the ultimate residues are run to the naphthalene trays, where the naphthalene is again separated.

Enrichment.

There remains the question of enrichment, on which I have not much to say. It is effected by bye-passing a portion of the scrubbed gas through the carburettors, of which there are two—one each for the coal gas and carburetted water gas. Both are of special types, which, however, call for no special comment. The petrol in use is of about ·760 sp. gr., commences to distil at about 70° C., and is completely distilled at a little over 100° C. Paraffin is also introduced in both carburettors.

Among the many side-issues arising from the extraction of toluene from coal gas not the least important is the question of the effect on naphthalene deposits. Experience, one gathers, has been mixed. Even if the actual naphthalene content of the gas is unaffected, the amount of carburation must play an important part. And, even if the enrichment is high, it by no means follows that artificially introduced hydrocarbons will act as efficiently as naphthalene carriers as do the natural hydrocarbons contained of the gas.

This is a point on which I am unable to offer definite information; but I mention it in the hope that some among us may be able to throw light upon it.

LIQUID PURIFICATION OF COAL GAS.

The current issue [May 15] of the "Journal of the Society of Chemical Industry" contains the text of a paper communicated by Mr. E. V. Espenhahn, of Melbourne, entitled "Some Notes on Ammonium Thiosulphate-Polythionate Solutions: A Contribution to Liquid Purification of Coal Gas."

He said: Investigations in the direction of the polythionic acids have proceeded from the mixture of these acids in the Wackenroder solution; while Debus carried out an exhaustive research on the potassium salts, and proved the existence of pentathionic acid, which was later confirmed by other investigators.

The salts of these acids assumed technical importance with the introduction of the Feld process for the recovery of ammonia and sulphuretted hydrogen from illuminating and coke-oven gas. His solutions of the zinc and iron polythionates with thiosulphate were superseded by the simpler and more effective ammonium thiosulphate-polythionate washing solution. This solution consists of ammonium thiosulphate which is treated with sulphur dioxide and forms polythionate, when it is brought into intimate contact with the gas in rotary vertical washers. The reaction with the polythionate results in the absorption of the ammonia and part of the sulphuretted hydrogen. As the solution becomes concentrated, a portion is withdrawn, treated with more sulphur dioxide, and heated, whereby the polythionates are converted into sulphate. By evaporation, a salt suitable for fertilizing purposes is recovered; and the process claims to solve the problem of utilizing the sulphur contained in coal for the fixation of ammonia without first forming sulphuric acid.

The following investigations were carried out by the author:

(1) The reactions occurring between thiosulphate and sulphur dioxide.

(2) The reactions between ammonium polythionate and ammonia.

(3) The reactions between ammonium polythionate + free sulphur dioxide and ammonia at 100°.

(4) The reactions between ammonium polythionate + free sulphur dioxide and ammonia and ammonium sulphide at 100°.

(5) Application of the reactions to the industrial process.

After dealing exhaustively with the first three sections of his subject, the author proceeds to treat of the

REACTION BETWEEN AMMONIUM POLYTHIONATE, FREE SULPHUR DIOXIDE, AND AMMONIA AND AMMONIUM SULPHIDE AT 100°.

The reactions detailed suggested the possibility of modifying the Feld process; and, as an alternative, it is suggested that the ammonia, after it has been washed from the gas, could be absorbed in a polythionate solution, which would replace the sulphuric acid universally employed. Owing to the slowness of the complete conversion of sulphur dioxide by thiosulphate solutions at ordinary temperatures, the Feld washing solution contains the minimum of polythionate necessary for the extraction of ammonia; so that this solution would not meet the requirements arising with high ammonia concentrations. Hence the substitution of part of the total polythionate by free sulphur dioxide.

To approach the conditions arising in actual practice, where the ammoniacal liquor contains ammonia in combination with carbon dioxide and hydrogen sulphide, with excess of the former, the previous experiments were modified by adding ammonium carbonate in solution to the polythionate containing free sulphur dioxide. On mixing and heating up to 100°, the carbon dioxide liberated carried away much of the ammonia added, unless a large excess of sulphur dioxide was present. By gradually raising the temperature after the solutions had been mixed and allowed to stand, no ammonia was lost, and the end reaction was practically identical with those of former experiments. As it was desired also to determine the factor of time, and as the formation of polythionate was less accurate by the addition of sulphur dioxide in solution owing to the presence of free sulphuric acid, the procedure of the previous experiments was reverted to.

Freshly-prepared ammonium sulphide, standardized to contain 22 molecules of ammonia to 1 molecule of sulphuretted hydrogen was first added to the polythionate solution. On mixing this with the ammonia and sulphur dioxide, the temperature rose appreciably, and fine sulphur was precipitated. After heating to 100°, this was absorbed, and the solution remained clear until decomposition of the excess polythionate occurred.

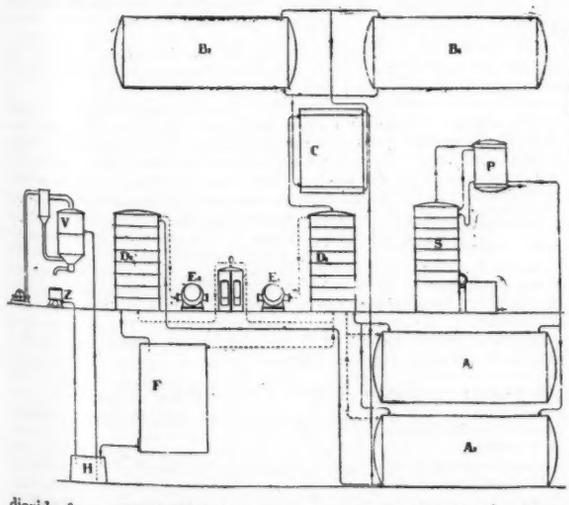
In contrast to these experiments, considerably less sulphate is formed by the ammonia molecules reacting in the presence of sulphuretted hydrogen; and the reaction is completed in a considerably shorter time. The rate of fixation of the free ammonia is not affected to the same extent by a decrease in concentration of the original polythionate, and is even accelerated with low polythionate and high sulphur dioxide content. The rate of the absorption is also more favourable with an increase of the total concentration.

It would appear that a line of demarcation cannot be drawn between the two separate reactions as suggested above, which are in reality more complicated and occur simultaneously.

The absorption of free ammonia by polythionate and free sulphur dioxide is thus more favourable in the presence of sulphuretted hydrogen, as the amount of polythionate in the absorbing solution can be reduced to a minimum and the period of absorption considerably shortened.

APPLICATION OF THE REACTIONS TO INDUSTRIAL PROCESSES.

The requirements for the successful recovery of sulphate of ammonia would be met by a plant of the following description: The ammonium thiosulphate solution, containing also sulphate, is partly converted into polythionate by passing through the absorber D_1, in the opposite direction to that of the gases containing sulphur



dioxide from the furnace O; and it runs into the tank A_1, until nearly full, when the solution is diverted to the tank A_2. Sufficient condensate from the still S is then passed into A_1, to allow an excess of polythionate after the absorption of the ammonia. The solution is then pumped through the heat-interchanger C, into the tank B_1, whereby the temperature is raised to approximately that of the other solution issuing from the tank B_2; and this latter solution is cooled for the absorption of sulphur dioxide in D_1. After maintaining the temperature at 90° to 100° until the solution becomes opaque, it is passed in the reverse order into A_1; while the solution from A_2 is forced into B_2. These operations are then repeated alternately. Any ammonia or sulphur dioxide liberated with the carbon dioxide from the tanks is recovered in the system by passing through D_1.

Ammoniacal liquor is fed in the still S, through the preheater P, which is so regulated that the water vapour carried over with the ammonia may be kept constant, and the solutions maintained at any desired concentration.

A portion of the solution is withdrawn periodically and pumped over the absorber D_2, where treatment with more sulphur dioxide is effected. The polythionate thus formed is decomposed into sulphate by heating in the tank F; and the solution is freed from its sulphur before running into the lower tank H. From here it is drawn into the vacuum-evaporator V, evaporated, and the salt dried in the centrifugal Z. The sulphur recovered is burnt in the furnace O.

Being cyclic, the process would be adaptable to continuous operation, and could prove effective provided that the sulphur dioxide and ammonia admitted to the system were maintained in the correct and constant proportions.

It is evident that advantages are to be obtained by the accumulation of sulphuretted hydrogen in the ammoniacal liquor undergoing recovery. Firstly, the absorption of the ammonia will be completed within a more uniform and considerably shorter period. Secondly, the sulphur will be recovered from the gas as such, as it will be precipitated on decomposing the polythionate solution. Thirdly, the formation of sulphate will be slow, and the process rendered more stable; since at no time must the concentration of thiosulphate in the absorbing solution decrease. Fourthly, subsequent purification of the gas will be rendered more economical, as a saving of space and labour is effected by relieving the work of the oxide of iron purifiers. Fifthly, more sulphuretted hydrogen would be absorbed from the gas than by washing with an ammonium polythionate solution.

Other advantages are that the process for its inception would entail no extensive alterations to the plant for the general indirect method of recovery of ammonia, which has not been universally superseded by direct recovery processes using sulphuric acid. The process would also be specially suitable, as a means of utilizing the sulphur, in combination with the washing process of Dr. W. B. Davidson*, or with a simpler method for the purification of coal gas as described by O'Neill at the Eighth International Congress of Applied Chemistry.

The author hopes that these suggestions will prove useful in overcoming the difficulties in the recovery of ammonia, due to shortage of sulphuric acid, although he is aware that protection of the above suggestions is fully afforded by the patent rights of the Feld process.

SUMMARY.

(i.) Sulphur dioxide is not absorbed by ammonium thiosulphate in the presence of ammonia unless polythionate is present in solution. It is then added to form polythionate, which does not decompose to sulphate at 100°; so that the amount of sulphate formed for each ammonium concentration is the same as with polythionate and ammonia.

(ii.) When ammonia acts upon ammonium polythionate and sulphur dioxide in the presence of sulphuretted hydrogen—that is, ammonia and ammonium sulphide—less sulphate is formed than in the absence of sulphuretted hydrogen, and the velocity of the reaction is considerably greater.

(iii.) The Feld process of ammonia recovery could be profitably modified according to the results of the experiments and for the reasons set forth.

* See "GAS JOURNAL," Vol. CXXII., pp. 948-58.

SULPHATE OF AMMONIA FOR ALLOTMENTS.

By J. MOGFORD.

[A Paper read before the Wales and Monmouthshire District Institution of Gas Engineers and Managers, May 16.]

In the spring of last year, the War Agricultural Committee of the Glamorgan County Council requested the local authorities in the county to provide allotments, and to use every endeavour to get all vacant land cultivated. In the Briton Ferry district, the communication was referred to the ground landlord (Earl of Jersey), who directed his Agent to provide the necessary land and allot 10 perches to each applicant.

Having been interested by the paper read by Mr. John West before the Institution of Gas Engineers in 1914, entitled "Lime and Sulphate of Ammonia as Fertilizers," and also by the discussion on the paper entitled "Home Sales of Sulphate of Ammonia," read by Mr. F. C. O. Speyer before this Association, at Caerphilly, in 1915, I secured a plot with the object of satisfying myself as to the value of sulphate of ammonia as a fertilizer for cottage gardens, and, if possible, to encourage its use, and so help to create a Home market.

The experiment was carried out under adverse circumstances; but the result was satisfactory. The land broken up for the allot-

ments was rough pasture, which had not been cultivated or manured for many years. The scheme was started late in the season; the land not being fenced until April. My plot was the last to be broken, and was planted late in May. Some of the holders were experienced cottage gardeners, who had been accustomed to the use of superphosphate and nitrate of soda, and they applied to their plots such small quantities of these fertilizers as they could obtain. It was difficult to obtain stable manure, and most of the allotment holders had to be satisfied with a small quantity.

My plot was well limed, and a very small quantity of stable manure was dug in when breaking-up. Quite a little sulphate was afterwards thrown over it broadcast. It was planted with potatoes. I believe they were the kind known as "Up-to-Dates," bought from a tradesman for table purposes, and were certainly not ideal seed potatoes. The holders of the adjoining plots were much interested in the salt which I had distributed, and, as they had already planted, were anxious to see the effect. When the plants appeared above the surface, fresh ground lime was dusted between the drills. This was washed into the soil by the rain; and sulphate of ammonia was then sprinkled sparingly between the rows. A few days later the hoe was used between the drills and the plants "earthed up." The effect was very pronounced. A remarkably strong growth was obtained, the haulms attaining a height of over 2 ft., and in some cases a thickness of about ¾ in. My neighbours now expressed the opinion that the "plants had been forced, and would be all tops," and that the crop would be disappointing. To satisfy their curiosity, some of the plants were raised on Sept 1. They were not fit for harvesting, but proved a heavy crop of fine quality. The interest of my neighbours was accentuated by the fact that most of their crops failed.

Having satisfied myself that the use of sulphate increased the yield to a remarkable extent, I determined to induce others to use it, and so in a small way help to create a Home market. When the first plants were drawn, two photographs were taken. [These the author exhibited. One showed the plot on which sulphate was used; the other a neighbouring plot. The pictures did not illustrate the different results obtained with and without sulphate as well as might be desired. But, on close inspection, it was noticed that the land in the second photograph was almost barren, whereas the strong growth of the plants in the other could be deduced from the fact that the haulms in the picture reached the shoulders of two 9-year old children. Where sulphate was applied, ¾ cwt. of seed produced more than 8 cwt. of tubers; but the plants shown in the second photograph hardly returned the weight of seed, planted.] The cottage gardeners in the district became keenly interested in the experiment, and each evening a small group could be seen examining the plots. To keep their interest alive I obtained a supply of pamphlets from the Sulphate of Ammonia Association, and distributed them among the visitors. I also presented a small sample of sulphate to those whom I knew to be enthusiastic amateurs, and advised them to try it on their winter vegetables. This they did, with satisfactory results.

Under the Defence of the Realm Act, the Board of Agriculture issued in December a "Cultivation of Lands Order." This Order, as you are aware, extended the existing powers of local authorities for providing land for cultivation, and enabled them to acquire vacant plots for the duration of the war; to do all things that are necessary or desirable to adapt any land for cultivation; to provide implements, seed, manures, and to do everything possible to increase the production of food; to induce men and women of all classes to come forward and give all the time and labour they could spare in order to secure that every available acre should be making its contribution to our home-grown supplies of food.

The Briton Ferry Urban Council immediately complied with the Order. Applications were received from about 350 people; and a 10-perch plot was allotted to each applicant. The Allotment Committee requested the writer to deal with the fertilizers required under the scheme. A supply of lime, superphosphate, bone compound, and sulphate of ammonia was obtained, and sold in quantities to suit the requirements of the Order. Potash salts were unobtainable. Each holder was advised to use the following for a 10-perch plot: 1¼ cwt. of lime when breaking the land, and a mixture of 28 lbs. of superphosphate and 10 lbs. of sulphate of ammonia—part to be used when planting, and the remainder as a top dressing.

The fertilizers were stored at, and distributed from, the gasworks, and each purchaser received instructions as to how they were to be applied. The majority of applicants for allotments had no previous experience in land cultivation. In order to avoid the efforts of these people resulting in disappointment, and their labour in the National cause being lost, everything possible has been done to instruct them. An expert gardener has been retained to visit their plots, and a number of Board of Agriculture pamphlets have been distributed to them.

The pamphlets regarding the use of fertilizers were: No. 56, "Manuring of Cottage Gardens and Allotments;" No. 80, "Use of Artificial Manures;" No. 106, "Fertilizers for Market Garden Crops;" No. 170, "The Use of Lime in Agriculture." These leaflets give detailed instructions as to when, where, and how to use the different fertilizers; and any intelligent amateur will hardly fail to understand them. About a ton of sulphate of ammonia has already been sold; and I am convinced that its use will create a steady demand in the district, and so help in a small way to build up a satisfactory home sale.

In conclusion, I would seriously commend every gas manager to obtain for himself or a representative a seat on the Allotment Committee in his district. He would then be in a position to advocate the use of sulphate as a top dressing, and by so doing he would assist in the production of home-grown food during the crisis which is apparently in front of us, and also help to build-up a home demand for sulphate of ammonia when it is in the unique position of being the only nitrogenous fertilizer on the market.

DISCUSSION.

The President said that with the argument of this paper they were most of them in agreement—that sulphate of ammonia was the best fertilizer.

Mr. F. Shewring (Pontardawe) remarked that the author had set gas managers generally an excellent example. He had tried for himself to see what sulphate of ammonia would do. The best results could only be obtained by continual experiments; and they had to realize that what might be suitable for one class of land was not necessarily suitable for another. Mr. Mogford very wisely obtained the services of an expert gardener for the allotment plots. Generally speaking, people were very apt to go astray in artificial manuring, through dabbling in a matter with which they had had no experience, and they should endeavour to get information which would be of use to the community generally. It seemed to him to be almost essential, in cases where local authorities broke-up meadow land, &c., with the object of increasing the supply of foodstuffs for the country, that they should always retain the services of an expert, who could advise on the use of sulphate and the mixtures of manure necessary for different conditions. It was only on these lines that they could hope to secure really the best results. Most of the members knew perfectly well that the ammonia applied in different forms had quite a different action. There were numerous factors to be taken into consideration; and if cottagers had to go into these matters in a blind manner, it would be apt to react on the sellers of the product itself.

Mr. J. H. Canning (Newport) complimented Mr. Mogford on his practical and opportune paper, which had come just at the right time in the national interests, and also in their own interests. As Mr. Mogford had pointed out, the field was wide open now for the development of the sales of sulphate of ammonia; nitrate of soda being for the moment out of the market. But there was a good deal of lee-way to be made up. Some extraordinarily exaggerated notions as to the power of nitrate of soda had unfortunately taken hold of a great many agriculturists; and it would be very difficult to expel them. They were, of course, all of them to a great extent gardeners now. He was speaking to some allotment holders a few days ago, and recommending the use of sulphate of ammonia; and one said he had about 6 lbs. of nitrate of soda, and as a great favour would spare a friend ½ lb., which he stated would be ample for an acre of ground. [Laughter.] This was an actual fact; and he merely mentioned it to give some idea of the obstacles that had to be overcome. The same man said that a few pinches of nitrate applied to the cabbages would produce vegetables of enormous proportions; and he also remarked that the use of nitrate of soda impoverished the ground. This was where Mr. Mogford's paper was so practical and so valuable. Many people recommended the use of sulphate of ammonia, without pointing out the necessity of supplying the other plant foods at the same time. The reason why nitrogenous manures exhausted the ground was that they merely supplied nitrogen; and the plant had to draw from the ground the phosphates and potash necessary. It was therefore impossible to do anything further until the phosphates and the potash were restored. Mr. Mogford had remarked on the present scarcity of potash sources. It was a very unfortunate fact that the Germans had practically the world's monopoly of potash in the enormous deposits in Alsace; but a very good substitute, in the absence of the actual refined potash salts themselves, was the ash of plants of every description. This could not at the present moment be too widely known. Allotment holders should collect leaves, stalks, wood, and everything of a vegetable nature and combustible, and burn it—keeping the ash, and spreading it over the plots. Only by supplying nitrogen, phosphates, and potash in combination, and in proper proportions according to the crop and the nature of the ground, could success be obtained. Mr. Mogford had shown himself to be what some of them had all along suspected—a many-sided man.

Mr. L. Murray (Blaina) emphasized the important part in this matter that was played by the nature of the soil, and referred to the question of whether or not lime should be used.

Mr. Mogford said that unless there was lime in the soil it was practically useless to put in all these fertilizers. In his own experience, lime in reasonable quantities one could not do without; but lime in excess immediately brought a corky kind of scab on the potatoes. He did not deal with potash salts, because his main object was to increase the home sales of sulphate of ammonia; but Mr. Canning had referred to this point. It was necessary to use as much ashes as they could; and, if obtainable, the ashes from greenish twigs, as they contained more potash than others. The point he really wished to make was that now they had a unique opportunity of getting people to use sulphate of ammonia. These Allotment Committees were being formed throughout the whole of the country. Nitrate has been practically unobtainable. Therefore they should at once seize the opportunity of getting the people to use sulphate of ammonia where they formerly employed nitrate. He had been surprised at the ignorance of the holders as regarded sulphate. There was not one man in ten who had heard of it; and consequently if it was handed to them, they were afraid to use it. If they hoped to increase the home sales, the producers should be careful of the form in which they put the sulphate on the market. He was afraid the greatest part of the difficulty, and the reason many people were afraid of sulphate, was due to the fact that it was frequently put on the market in a state which was not suitable for use by an amateur. It was often lumpy; and when distributed over the ground, these lumps, coming in contact with the vegetables, soured the soil and destroyed the plants. It was most important from the gas managers' point of view, if they wished to encourage home sales of sulphate, that they should immediately put their house in order, and sell the sulphate in such a condition that it could be used by an amateur without the risk of getting him into serious trouble.

ECONOMIES IN LIGHTING IN RELATION TO FUEL SAVING.

This was the subject of a discussion at the meeting of the Illuminating Engineering Society on Tuesday last, at the Royal Society of Arts, when Mr. A. P. TROTTER, the President-Elect, occupied the chair.

SMALL ECONOMY ONLY POSSIBLE FROM REDUCTIONS IN LIGHTING.

Mr. LEON GASTER, the Hon. Secretary, opened the discussion. In the course of his remarks, he said the subject, which had special interest for the members, was referred to incidentally at the opening meeting of the session in connection with the Summer Time Act. Since then the need for economy in the use of fuel has assumed greater importance; and the whole subject should, therefore, be reviewed during the summer months, before the period is reached when artificial light is mainly required. The first point to be considered is the extent of the economy in fuel that could, in any circumstances, be expected to result from restriction in lighting. Then this possible saving should be considered in relation to its effect on industry, public convenience, and safety. In these days artificial light is no longer regarded as a luxury. It is a public necessity; and it is therefore very important to select carefully the directions in which economy is to be exercised, if such economy is found to be inevitable. According to the report of the Board of Trade on the output of coal in the United Kingdom, the figures for the last four years are as follows: 1913, 287 million tons; 1914, 265 millions; 1915, 253 millions; 1916, 256 millions. Thus, while the output during 1916 showed a small advance over 1915, there is still a diminution of over 30 million tons as compared with the last year before the war.

In giving evidence before the Committee on the Summer Time Act, Mr. Faraday Proctor, the Hon. Secretary of the Incorporated Municipal Electrical Association, stated that the units generated for both electric light and power totalled to about 2000 millions; and of this something like 23 p.ct. is estimated to be used for lighting. Assuming roughly 4½ lbs. of coal per unit sold, this would be equivalent to about a million tons of coal used for the lighting load. Similarly Mr. Hanbury Thomas, of the Sheffield United Gas Company, estimated the total consumption of coal by the gas industry in 1915 to be approximately 18 million tons. Although this has possibly increased during the past year, it is probable that the amount used for lighting would not be more than a quarter of the total; so that the consumption of coal for lighting by gas and electricity throughout the country is probably well within 6 million tons, which is only 2½ p.ct. of the total coal output.

When it is recalled that of this amount a very considerable proportion is used for indispensable purposes—*e.g.*, in munition and other factories, in necessary public lighting, &c.—it can be seen that one must not form too extragagant a conception of the possible economies in the lighting field. This impression is confirmed by a study of the saving estimated to be accomplished during the operation, for four-and-a-half months, by the Summer Time Act, in 1916. According to the report of the Committee, witnesses estimated the saving from the reduction in gas lighting at about 260,000 tons, and the corresponding saving on the part of electricity supply undertakings at less than 60,000 tons on the highest estimate. The combined saving thus amounts to only about 0·1 p.ct. of the total coal output.

Looking at the matter broadly, one would naturally assume that the most profitable field for economy is in the large items in our national coal consumption, where a relatively small percentage saving would have a far greater proportional effect. This is not to say, however, that in times like these any waste of light should not be rigorously avoided. The diminution in coal output in 1916, as compared with 1913, is three times the estimated consumption in lighting; so that the margin for the less essential branches of lighting is obviously small.

A GENERAL REDUCTION OF LIGHTING IMPRACTICABLE.

Turning to the question of where a diminution in lighting could be profitably brought about, Mr. Gaster said it is impracticable to aim at a general reduction of (say) 10 p.ct., irrespective of the purpose for which the light is applied. It would clearly be folly to aim at an undue diminution in munition works and factories, where the expenditure in securing adequate illumination is small in comparison with the benefits secured in the form of improved output, avoidance of spoiled work, and better health and spirits of the workers. Similarly any additional indiscriminate reduction of lighting in the streets would now be deprecated on grounds of economy, since any fuel-saving thus accomplished would surely be of small value in proportion to the risk to safety and the public inconvenience. At the same time, while the recent alteration in lighting in the Metropolitan area has been a great improvement, there is probably still opportunity for inquiry in connection with the screening devices sometimes employed.

CLASSIFICATION OF LIGHTING—WASTEFUL LIGHTING SHOULD BE ATTACKED.

As a preliminary to any restriction of lighting with a view to fuel-economy, the division of illumination into four main categories might be suggested: (1) Safety—as regards prevention of accidents. (2) Lighting for indispensable purposes—munition works, factories, &c. (3) Lighting for public convenience. (4) Luxurious and spectacular lighting. The first two divisions clearly ought not to be interfered with, except in cases where it can be indisputably shown that the light is excessive or wrongly applied for the purpose in view. Division 3 should only be touched in case of grave necessity; while Division 4 should be the first to which further restrictions should be applied. The classification under these four headings would naturally require care. It may perhaps be assumed by many people that there is little or no lighting falling under Division 4. One can, however, recall instances of light being used in a way which, while permissible, even if not really desirable in ordinary circumstances, is hardly justifiable now. Even before the war it was pointed out that the exhibition of large numbers of lamps, or very powerful lamps of undue brilliancy, outside shops and places of entertainment is a bad policy. It should surely be possible, by a little ingenuity, to attract public attention without this species of glare. In shop-window lighting and in restaurants, there is frequently waste of light. The allocation of a certain amount of gas or electricity to a window for specified purposes or to a given area might be considered; and methods of using the available light to the best advantage made more familiar to the general public.

EDUCATIONAL METHODS PREFERABLE TO REGULATION.

In the first instance, it would probably be best to attempt such economies by educational methods rather than hard-and-fast regulations. If such an educational movement was based on the inculcation of the general principles governing the proper use of light (avoidance of glare, proper shading, &c.), they would have valuable results for the future, apart from their present utility as a stimulus to economy.

A JOINT COMMITTEE SUGGESTED.

In conclusion, Mr. Gaster suggested that the whole question of economies in lighting should be referred to a Joint Committee (on which the Society should be represented) during the summer months, with a view to advising the authorities regarding the best steps to be taken when winter arrives. Such a Committee, acting with official recognition and support, might survey the whole field of lighting, and make broad classifications into the four categories previously defined, with due regard to the variety of circumstances in different districts. The same considerations that govern the division of industries into "essential" and "non-essential" would be borne in mind. Having further taken into account the effect both on the public and the lighting industry of any change, and the saving in coal that might be expected to result, the Committee would be in a position to inform the Government where a saving could be made with a minimum of risk and inconvenience. Information of this kind would be of great value as a basis of action in the form of orders or legislation. The Committee might also prepare the ground for restrictions by drafting pamphlets for public distribution showing, by concrete examples, the amount of light necessary for various purposes, and the directions in which various sections of the public would be expected to economize. Even should extreme economy in lighting happily be found unnecessary, the information gained through such an inquiry would not be wasted, but would provide useful material for future use, especially by gas and electric supply undertakings.

SUPPRESSION OF PRIVATE POWER PLANTS ADVOCATED.

Mr. H. FARADAY PROCTOR (Bristol), in another contribution, discussed the matter from the electrical point of view. He considered it was quite a reasonable assumption that diminution in the consumption of electricity due to economies being advocated would not exceed about 10 p.ct. Such a reduction would result in lowering the coal consumption of electrical undertakings by about 1½ p.ct. only, having regard to the fact that the lighting units sold by electrical undertakings were only about 2⅓ p.ct. of the total output of units. Such reduction would amount to about 60,000 tons of coal per annum for the whole kingdom. The loss in revenue to the electrical undertakings would be in the neighbourhood of £500,000 per annum. As few, if any, electrical undertakings were making more than a reasonable profit on their capital outlay, a diminution in revenue unaccompanied by a corresponding diminution in costs must ultimately result in an increase in the price of gas, or at least in the postponement of a reduction of it. In either case, the consumer was not likely in the long run to reap a financial benefit commensurate with the reduction of his consumption of energy. It was therefore little use looking for a substantial reduction in coal consumption as resulting from economy in lighting. To conserve coal the raw material must be used efficiently. The burning of coal as fuel prior to the abstraction of what were termed the bye-products was in itself wasteful; but the great power stations were the least sinful in their methods. Assuming for the sake of argument that the coal consumption of the average privately owned engine per horse-power-hour was double that of the engines in an up-to-date power house, the change-over of only 16,000 K.W. of load of a 25 p.ct. load factor from privately owned plant to public supply mains would result in a saving of about 60,000 tons of coal per annum—the losses in beltings and other inefficiencies superseded being set against the electric transmission losses. Thus a comparatively small change-over by power users to up-to-date methods of driving would result in economies that would balance those obtainable from general lighting economies, and would benefit all the parties concerned. Economy in lighting must be looked upon purely as a war measure, and that solely with a view to a small reduction in the coal consumption throughout the country. It must be realized that to bring about a substantial reduction in coal consumption, wasteful methods must be abolished. He trusted that in the near future the Government would bring pressure to bear upon the users of private plants whether by taxation or otherwise; and that they would be compelled to utilize the public supply wherever it is available on reasonable terms. The end to be aimed at was that the burning of raw coal should be prohibited except to licensed users. The result would be enormous economies, and such a clear atmosphere in our country that, among other things, economy in artificial lighting would be the indirect result.

FIELD FOR ECONOMY IN POWER PRODUCTION AND APPLICATION.

Mr. J. F. CROWLEY, B.A., M.Sc., thought the suggestion made by Mr. Gaster, that the question of fuel economy in relation to lighting ought to be considered by a Joint Committee, was a very sound one, because on the Committee they would have representatives who would see to the interests of illuminating engineering in this matter, and would have in mind the struggles the Society had had since its formation to secure efficient lighting in the country, and due attention to the principles of such lighting. This was a question of coal conservation; but in this connection he thought it might be pointed out that the output of coal per man in this country had been steadily falling during the past fifty years or so, and it now stood lower than in any other country.

Therefore the conservation of coal was becoming an increasing problem for this country; and as Mr. Faraday Proctor pointed out, the problem had relation to the use of efficient methods in power production. None of the bodies who had been dealing with this matter had suggested that there should be any economy in the use of power in any industry. On the contrary, the suggestion made by all the bodies who were dealing with this matter was that, if this country was to be industrially successful in the future, power must be used to a greater extent than heretofore. This meant that, if they were to conserve their fuel resources, they could only do it by economy in the methods adopted to produce power. Applying the same principles to lighting, if they were to secure economy in fuel, they must do it through the methods by which they used and applied the light. But at the same time they must be very careful to remember that the natural tendency ought to be to increase the quantity of light at present used in industry rather than restrict it. He was not speaking of any temporary war measure, but rather of the whole question of economy of fuel after the war. The problem was really one of efficiency of method both in production and application—the same in regard to lighting and power. The two problems, however, were in one respect very far apart. The total consumption of coal in the country for lighting was probably, as had been said, 6 million tons per annum. But when he told them that the economy in the use of coal for power purposes in one year might mean eight or nine times the 6 million tons, it would be seen that the problem of the reduction of the consumption of fuel was largely one that concerned power purposes, while the problem so far as lighting was concerned was a much smaller one.

Luxury—The Margin of Waste.

Mr. J. S. Dow said there was one point they had to bear in mind when discussing a subject like this. Whereas, as Mr. Gaster and Mr. Proctor had pointed out, the amount of coal consumed for lighting was very small, the margin for coal saving for lighting was also small—that was to say, in normal times, they used more or less luxurious lighting; but the coal left over after attaining the absolute amount of lighting necessary was very small. But when the country had reached, as it had now, an actual deficit in the amount of coal turned out as compared with the period before the war, it was quite obvious that this must affect the amount of coal that could be used for purely luxury purposes. Therefore, although the saving that could be made was small, yet it was a thing they might be driven to consider; and during the summer they should make up their minds whether or not there could be a saving when the winter came along. Public opinion was pretty sure to demand that lighting should be reduced in some way, and, when they had to make a saving, they must make it in directions where it would be least serious. It was quite recognized that in many districts, the supply undertakings had not at present an easy task to deal with the factory load; and therefore if they could do anything to reduce the demands that came heavily on the load at certain periods of the evening, this would be a help—such as outside lighting and for cinema theatres. In their Society, they had before contended that the massing of large groups of powerful lamps, or the sticking of small lamps at intervals all over a building, was really not necessary or essential. When they came to think of it, the heaping-up of light in this fashion was an unimaginative way of attracting public notice. All that was wanted to attract public attention could be done without having all this outside lighting. Then as to the lighting of shop windows, he did not see why they should not draw up a few general directions to enable the lighting to be carried out in a more scientific way. All these things might not be considered worth doing from the national standpoint of saving; but they all of them fitted in with the policy the Society had always pursued in arriving at the wise use of lighting in times of peace. His idea was that they should get people to economize, not by an indiscriminate reduction of lighting, but by educating them to use light more scientifically. He thought in the future it might be worth while the authorities considering whether they should not draft pamphlets for various sections of the community, giving commonsense hints as to how they could reduce their lighting.

An Avoidable Extravagance.

The Chairman remarked that in this matter there were two points—war economy, and the general economy of (say) next winter's coal. They had already had circulars from Government Departments asking them to economize for the sake of coal. If, however, they came to consider what they were already doing, they would find an economy of a spontaneous nature through the changes of practice in their domestic arrangements, which must obviously save on meter readings, both gas and electric. But when they came to investigate the amount of coal that had been saved, it would be found to be a very small amount. There were other economies, as Mr. Gaster and Mr. Dow had suggested, which had been brought to their notice since the lighting relaxations. They would remember what a dismal place London was at night time before Christmas last; but, since the lighting relaxations, they had seen again much unnecessary outside lighting. This carried their minds back to early in the war when the public lighting authorities were told to shut-down the street lighting. It then very soon became evident that a large number of people were contributing to street lighting other than the local authorities who provided the street lamps. Some of the worst examples were the tobacconists, with absolutely painful dazzling lights. He did not know whether it would be interfering too much with the liberty of the subject to tell these people they must not do this after the war. They would probably say it was merely an advertisement; and whether such excessive lighting could be dealt with from the point of view of economy was rather doubtful. There was one source of waste now going on in many parts of London. Streets that were lighted with arc lamps fitted with opal globes were still so lighted; but with the globes painted black. This was disgraceful extravagance. These lamps—which were taking at one time 9 amperes, and were probably taking 7 amperes now—could be replaced by small incandescent glow lamps—giving more light with a 60-volt lamp, and without any alteration to the wiring. Why this was not done, he did not know.

Mr. Gaster's Reply.

Mr. Gaster, in closing the discussion, said it was found in the making of regulations that Government officials were called upon to deal with circumstances over which they had no control, and of which they had no knowledge. They sometimes merely jumped at conclusions, and made regulations which might be unnecessarily hard from the point of view of the public. Every learned or trade society ought, if they had any opinion to offer the Government, to do so, whether or not they took it. If they did not take the advice, it would be open to those who tendered it to say afterwards: "We told you so, but you did not chose to pay any attention." He thought they as a Society should investigate the subject, and then tell the Government departments interested the conclusions at which they had arrived. If they offered intelligent assistance, and it was not accepted, then they had a right to ask why not. A Board of Fuel Research had been appointed; they did not wish to force their hands, only to co-operate with them. He knew of one central station that was using 20,000 to 30,000 tons of coke. They could get coke where they could not get coal. There was economy in such use. If the Council were encouraged by the members to pursue this matter of the economy of coal in relation to lighting, they would be fulfilling a national duty.

The President thought the matter could be left in Mr. Gaster's hands to say what should be done by the Society.

Composition for Gas-Engine Pipe Joints.

To overcome the trouble often experienced with the water joint on the exhausts of gas-engines, of the joint breaking-out at the end of a few weeks—generally due to the expansion and contraction of the joint, and also to the fact that the joint has a very small surface—a new preparation, the invention of Mr. Robert Neville, of the National Chemical Works, Limited, South Acton, has been introduced. The composition, when applied as a facing to the water-joints of 500 H.P. gas-engines, running on coke-oven gas, has, it is stated, stood a temperature of 1100° C. and acid action, and after nine months' test shows no sign of breaking-down.

Evening Star Chapter.

At the annual meeting last Thursday of this Chapter of Royal Arch Masons, the following officers for the year 1917-18 were appointed and invested:

Ex. Comp.	W. Thomson (Ramsgate), M.E.Z. 429.	M.E.Z.
,, ,,	Arthur E. Eves, P.Z. 1201	H.
,, ,,	William Dommett	J.
,, ,,	Rae P. Normand	Scribe E.
,, ,,	W. A. Surridge. P.G.Std.Br., P.Z., 1201, 1397, 1719	Treasurer.
,, ,,	J. W. Broadhead, P.Z. 61, 1719, P.Prov.Dep.G.Reg.W.York . . .	D.C.
,,	A. E. Broadberry	Sc.N.
,,	W. Edgar	Organist.
,,	George Hands	P.Soj.
,,	A. C. Beal	1st. A.Soj.
,,	W. R. Silk	2nd A.Soj.
,,	Arthur Valon	Stewards.
,,	F. C. Tilley	
,,	H. W. Packham	

The "Ideal" Hot-Coke Transporter.

A number of photographs of the "Ideal" hot-coke transporter installed by Messrs. Drakes, Limited, of Halifax, for the Manchester Corporation Gas Department, at the Bradford Road works (together with a complete carbonizing plant), have been prepared by the firm, with a description of the apparatus, and a statement of the advantages claimed for it. The invention is the subject of a patent, which will be found abstracted in the "Journal" for Nov. 21, 1916, p. 400. Mounted on a bogie running on rails in front of the retort-bench, there is an inclined elevator, with one large bucket or skip, into which the coke is delivered gently from the various tiers of retorts by means of shoots. The skip travels on two tracks, the divergence of which causes it on reaching the top to slowly tilt, so that the coke is discharged into a shoot in the retort-house wall prepared to receive it. The coke then slides down the shoot, and is spread in an even layer upon the quenching bench. An adjustable platform is provided on the machine, to enable the attendant to look after the mouthpiece lids. It is said that the actual time taken in discharging a 24 in. × 18 in. × 22 ft. long retort, and depositing the coke on the quenching bench, is 35 seconds; while the skip is in position to take the next retort in a further 10 seconds—the whole cycle of operations being thus completed in 45 seconds. The movements here briefly outlined are shown by a well got-up working model which Messrs. Drakes are sending out, attached to a calendar.

Municipal Gas Accounts for 1915-16.—Receipt has to be acknowledged of a copy of the "'Gas World' Analyses of Municipal Gas Accounts for 1915-16," the price of which is 10s. 6d. net. The two large sheets of tables are printed on linen-backed paper, so as to withstand any amount of usage, and bound in a cloth cover. Full information is given with regard to the accounts and the working of 73 municipally-owned gas undertakings of different sizes. These tables enable a great variety of comparisons to be made; and for the purpose of facilitating this, a card with the different headings is provided, on which can be filled in the figures relating to the undertaking which it is desired to compare with any of those included in the tables.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Early Training of Youths.

SIR,—Mr. H. A. Bennie Gray's paper, read before the Society of British Gas Industries, has again brought to notice one of the most important industrial and social questions of the day.

I see, however, that neither he in the paper in question, nor Mr. Milbourne in your issue of the 8th inst., has mentioned one phase of the subject, and lying at its very root—viz., the need of greater care in the selection of those who train our boys. At schools attended by working-class boys, the teachers are mostly drawn from among those who have themselves received their primary education in these schools, and so have not had the advantage of being surrounded in their early years by the same kind of moral code which makes our public schools so valuable. The method of selection too frequently follows our practice of being economical in things that matter most. Higher salaries must be paid to draw the best men to this important work. Their ability to teach the usual school subjects should not be their only recommendation; but men are required who can make boys feel that truth, justice, and unselfishness are something real, and that they must learn how to become good citizens. Too often the modern boy has not had these principles instilled into him; so that when he goes out to work he has very little regard for truth, and is only just and unselfish when he does not see that it will do him any harm to be so. It is not his fault that he does not know better.

The practical instructors in Technical Schools are chosen in very much the same way as teachers are selected. These men should not only have technical skill, but must always impress those in their charge with a sense of their integrity and fairness.

I quite agree that there is great need for better training for boys taking up trades; but let us start earlier, by improving their knowledge of life and its duties while they are schoolboys.

FREDK. CHARLES TILLEY.

53, *Kingsland Road, N.E., May* 17, 1917.

British Standards, Weights, and Measures v. the Metric or Decimal System.

SIR,—Now that the London Chamber of Commerce, the Decimal Association, and kindred institutions, as well as individuals, have submitted their case for abolishing the existing British coinage, weights, and measures in favour of the metric or decimal system, we think it right to point out that there is a large body of responsible opinion which is strongly opposed to such a change.

We do not contend that the maintenance of the existing British system does not involve certain disadvantages to the user; though they are almost entirely restricted to foreign commerce. These disadvantages, however, are mainly due to the fact that, in dealing with countries where the decimal or metric system is in force, difficulties have arisen in working the two systems in combination. These difficulties have been greatly exaggerated, and are for the most part of a purely arithmetical character. Yet, undoubtedly, they exist; and it is by reason of them that a demand has arisen for some change which will avoid, or at least minimize, them.

Those who are in favour of such a change argue that the only possible course to adopt is to abolish by legislation the existing British standards, weights, and measures, and to substitute the metric or decimal system, which, as should be well known, has its own inherent defects and limitations, even when compared with our own.

The difficulties involved in such a course are admitted to be great, even by those who advocate the change. The cost to the nation would be enormous; and, while it would involve all businesses, it would benefit mainly the largest and those engaged in foreign trade. The time necessary to bring into operation so far-reaching a revolution would be considerable. On the conclusion of peace, trade (and especially foreign trade) will call for the highest energies of this country; and the nation which is most ready to resume foreign commerce will stand to gain proportionately. To select such a time as this for inaugurating so far-reaching a change, with its inevitable scrapping of our existing system of book-keeping, weights, and measures, would be an act of doubtful wisdom, even if the ultimate necessity could be proved up to the hilt, and there were no alternative course to adopt.

Fortunately for the interests of this country, this is not the case; and it is possible at the same time to maintain our existing system, while bringing its use into harmony with the requirements of foreign trade, and at last enabling commercial men in this country to compete on equal terms with their Continental concurrents.

The adoption of such an alternative has been rendered possible by a simple and ingenious method which enables anyone, in buying, selling, or cataloguing, to calculate British prices in any foreign currency, weight, or measure, or *vice versâ*, by the simple multiplication of the price by one factor. The principle applies to every calculation—no reference or knowledge of the difference in weights, measures, and currency being required. Moreover, it is equally applicable to every country in the world; so that foreigners can adopt it with equal facility. The necessary tables are being revised and checked for publication, and will be ready shortly.

It is impossible in so brief a summary to set out all the advantages of this method; but we would refer to articles which appeared in the "Investor's Review" of Feb. 17 and March 17 last. It is emphatically our conviction that this "simple method," when known and understood, will be welcomed as eagerly by men of affairs as Napier's logarithms were three centuries ago by men of science.

SCOTT, ARMSTRONG, & CO.

57, *Moorgate Street, E.C.* 2,
May 18, 1917.

REGISTER OF PATENTS.

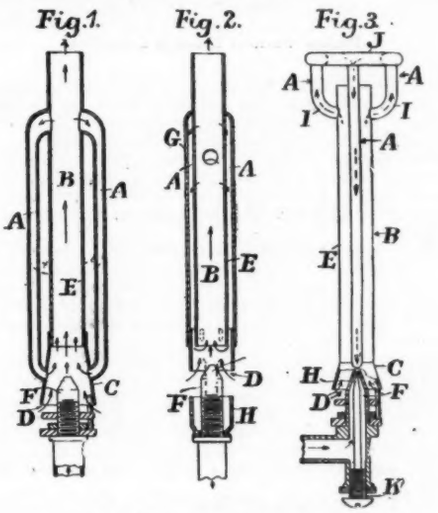
Bunsen Gas Tubes or Burners.—No. 102,922.

STEWART, C., of Brunswick, and GIBSON, R., North Melbourne, Victoria.

No. 7432; May 25, 1916. Convention date, Dec. 22, 1915.

This invention refers specifically to gas-burners of the bunsen type comprising a jet injecting gas under pressure centrally within one end of an open-ended mixing-tube having apertures about the jet for the indraught of air for admixture with the gas to form a combustible mixture. From experiments and tests conducted by the applicants, it has been ascertained that the most efficient combustible mixture is not attained on account of the travel of the gas being slightly faster centrally through the mixing-tube than the air drawn into the tube through the apertures—a lack of efficiency that "obviously results in incomplete combustion with resultant loss in gas economy."

It has already been proposed, they point out, to set up in an incandescent gas-burner a return circulation of the gas and air mixture within the sphere of the mixing process by providing bye-passages outside of the mixing-tube, which conduct part of the mixture from a point in the mixing-tube in advance of the gas-jet back to a point behind the gas-nozzle. But, according to the present invention, the mixture is returned to the mixing-tube in line with, or in advance of, the orifice of the gas-nozzle—such return circulation it is said giving greater efficiency than when the return is to a point behind the nozzle.



Stewart and Gibson's Bunsen-Burner Tubes.

In fig. 1 the bye-pass conductors A of pipe form proceed from near the upper end of the mixing-tube B and the lower ends deliver into the cone C of the burner. The base of the cone is as at D open to the atmosphere, while on its top end is mounted a tube E forming the mixing chamber. The gas-jet F has a terminal tapered portion and delivers centrally within the cone.

In fig. 2 a bye-pass A is provided by the arrangement of an exterior sleeve G forming an annulus communicating with the mixing-tube B through apertures in the tube. The sleeve fits over a short tube H, provided with air admission apertures D, and into which the jet F is screwed—the upper end of the tube being attached to the adjacent end of the mixing-tube B by distance-pieces.

In fig. 3 the bye-passages A are formed by tubes I extending upwardly from the upper part of the mixing-tube B and connected to a ring-shaped tube J, from which tubes extend downwardly and are connected to the lower part of the mixing-tube about the gas admission point. In this construction the gaseous mixture from the upper part of the mixing-tube bye-passes upwardly through tubes I, along the ring-shaped tube J and down tubes, where it is drawn into the lower part of the tube. The mixing-tube is attached to the cone C. The air admission opening D is regulated by a nut, and the gas by a needle valve adjustable by a screw K.

Controlling the Draught on Furnaces.—No. 105,579.

DRAKES LTD. and DRAKE, J. W., of Halifax.

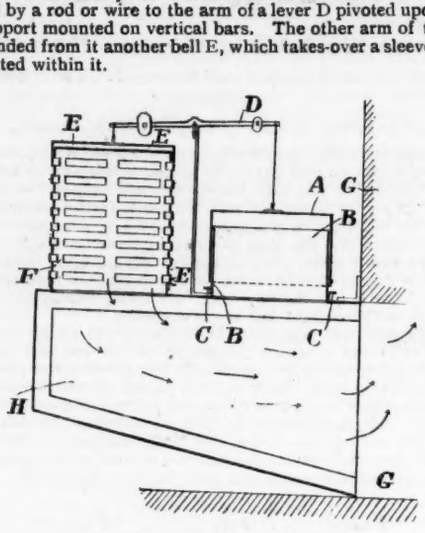
No. 3947; March 17, 1916.

In connection with (especially) regenerative furnaces used in gas-works (where the draught is induced by a chimney or uptake), the draught on the furnace, and therefore the amount of air for supporting combustion, is varied according to atmospheric conditions—either as to the temperature of the atmosphere or the direction of the wind (or both), with the result that at one time the heat of the furnace or consumption of fuel therein may be as desired, yet at another time the draught may be so strong as to increase the heat and, consequently, the consumption of fuel far beyond the desired extent.

To overcome these objections the patentees propose to make use of a device—illustrated, p. 346, in sectional side elevation—mounted over a cavity or chamber adjoining the base of a chimney or uptake.

They mount a bell-shaped device A to cover closely or take-over a sleeve B, "so that as little leakage of air as possible will take place."

Or the base of the bell is flexibly connected (by a leather or rubber covering) to an annular piece C at the base of the sleeve. The bell is connected by a rod or wire to the arm of a lever D pivoted upon a horizontal support mounted on vertical bars. The other arm of the lever has suspended from it another bell E, which takes-over a sleeve or fixed bell mounted within it.



Drakes' Furnace Draught Controller.

Through the walls of the bell slots are formed corresponding in number and size approximately with slots formed through the walls of the inner bell F. The slots in both cases are approximately of even width; while the width of the metal between the slots is rather larger, in order to cover the openings or slots in each case. Thus when the outer bell is in its normal position over the inner bell (as illustrated), the portion of the intact walls of E covers the openings of the inner bell, while the intact walls of the inner bell cover the openings through the walls of the bell E.

The bell E, with its counterbalancing weight, is heavier than the bell A. Consequently, when in its normal position the lower edge of the latter bell will occupy a position above the stop piece C surrounding the sleeve B, and the space between the lower edge of A and the annular piece C approximately equals the spaces through the walls of the bell E and its inner bell F.

The apparatus is mounted so that the uptake of the chimney G has free access to the interior of the chamber H, the sleeve B, and bell A, as well as to the bell F, so that the draught, when exceeding a certain power, causes the bell A to descend by acting directly thereon to exhaust the air from within the chamber H and the sleeve and bell B and A; whereas the suction does not affect the actions of the air within the bell E, since the cover of the bell F within it is a protection against such action.

Thus when the draught on the chimney exceeds a given power, it has the effect of causing the bell A to descend and simultaneously causes the bell E to rise in order that air from the atmosphere may be permitted to pass through the openings in the two bells E F down into the chamber H, through the chamber, and into the uptake G (as indicated by the arrows) to counteract the draught in the uptake and bring it to its normal conditions, on which the descending of the bell E will again bring the parts into their normal positions.

Increasing the Manurial Value of Gas Liquor.

No. 105,729.

Schubert, A., of Pasing, Germany.

No. 17, 818; Dec. 11, 1916.

According to this proposal, the manurial value of gas liquor is increased by subjecting it, together with the crude tar obtained in the course of the dry distillation of gas coal, to a second distillation, and collecting the distillate which passes over up to 200° C. separately—separating the gas liquor from the oily portion of the distillate and diluting it with water before its application as a fertilizer. The heating of the crude tar with the gas liquor (in the course of which operation a final temperature of 200° C. is attained) is said to be best effected by the aid of superheated steam in distillation retorts provided with stirrers for diminishing the foaming.

Through this utilization of gas liquor insects injurious to plants—such as snails, worms, grubs, spring-tails, and the like—are held to be quickly destroyed, and also injurious vegetable growths (such as moss and lichen) and weeds are hindered in their growth and eventually destroyed. A portion of the constituent parts of the gas liquor acts immediately as a manure—that is to say, it goes in the plants without any co-operation of the soil and is taken up by the plants; while the other portion is split off under the influence of the atmospheric agents, or acts in the manner of a carbonic acid fertilizer.

According to the quality and kind of the soil to be treated, a dilution of the fertilizer with water is effected in the proportion of one part of the fertilizer to from three to ten parts of water.

The Gas Light and Coke Company have notified the Lambeth Board of Guardians that, in consequence of the serious rise in the cost of materials and labour, they are compelled to increase their charges for mantle maintenance, &c., under their contract by 25 p.ct. As the present price was in operation before the war, the Board have agreed to pay the increase.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

The South Staffordshire Mond Gas Bill has been returned from the Commons agreed to, with amendments.

The Gas Light and Coke Company's Bill has been reported, with amendments.

HOUSE OF COMMONS.

Progress of Bills.

The Haslemere and District Gas Bill, the Hemel Hempsted Gas Bill, and the Lea Bridge District Gas Bill were read a second time, and committed to the Unopposed Bills Committee, to meet to-morrow (Wednesday).

In the case of the Kenilworth Gas Bill, the Examiners reported that the Standing Orders had been complied with.

The South Staffordshire Mond Gas Bill was read the third time, and passed, with amendments.

Street Lighting in London.

Mr. Lough asked whether any London Borough Councils had intimated their desire to economize coal and other supplies by reducing the public street lighting during the summer; whether certain gas companies had stated that they were unable to carry out the reduction because of the lighting regulations under the Defence of the Realm Acts; if so, whether the Government still regarded economy in coal consumption desirable; and if the Home Secretary would take steps to make it clear that local authorities should be enabled and encouraged to bring it about by reducing the waste of gas and electricity in the same way as had been accomplished by the regulation prescribing the early closing of shops.

Mr. Brace: Representations on this subject have been received from several Borough Councils. It is most desirable to secure economy in consumption of coal in every possible way; but it is important for military reasons that any reduction in lighting should be carried out uniformly throughout the Metropolitan area. I have been in communication with the military authorities on the matter, and hope in a few days to communicate with the Borough Councils with a view to securing such saving as may be possible during the summer months.

Profits on Coal Mining.

Mr. Currie asked whether recent returns indicated that the coal-mining industry had been earning excess profits; and, if so, to what extent.

The Chancellor of the Exchequer replied that he could add nothing to the replies he had already made to similar questions.

LEGAL INTELLIGENCE.

Koppers Coke-Oven Patents.

The fight over the Koppers coke-oven patents, covering "processes and apparatus for the recovery of bye-products from gases arising out of the carbonization of coal," was resumed in the Patents Court on Thursday last, before the Controller of Patents (Mr. Temple Franks), and Sir Cornelius Dalton. Since Messrs. Simon-Carvès, Ltd., of Manchester, first applied, on Jan. 24, for licence to use two German patents—No. 20,870 of 1904 and No. 16,386 of 1905—there have been two or three hearings, in Chancery and Divisional Courts, raising the question of the jurisdiction of the Patents Court to deal with the patents. Mr. Victor Derry claims that the English rights in the patents rest in a partnership with which he is associated ["Journal," April 24, p. 153]; and when the application for licence by Messrs. Simon-Carvès, Ltd., was last before the Patents Court, Mr. Terrell, K.C. (for Mr. Derry), after disputing that the Court could touch the patents, and contending that, despite the German registry, they were not alien enemy, gathered up his papers and left, saying he would seek redress elsewhere. He attended the hearing on Thursday, and announced that Mr. Justice Younger had suggested that he should return to the Patents Court and place before it the information on which it could decide whether or no it had jurisdiction. This he proceeded to do. The Controller said he gathered Mr. Terrell still had to take the matter before the Court of Appeal. This would delay the next hearing of the Patent Court. The problem of an order vesting the patents in the Public Trustee still had to be settled. Mr. Terrell observed that, if the Board of Trade granted this application, in spite of the opposition, and issued Messrs. Simon-Carvès a licence, it would be open to the partners, or any of them, to commence an action in Chancery to have it declared that the order was invalid, and to restrain these licensees from proceeding under their licence. The Controller closed the hearing, and ordered the proceedings before the Patents Court to stand adjourned to June 14.

Animals Made Transparent by Coal Tar.

An extraordinary claim to a new virtue in coal tar bye-products—that of rendering animal bodies transparent—has just been made in the Patents Court. The Trustees of the South Kensington Natural History Museum applied for licence to use the German patent No. 8621 of 1909, in the name of Hermann Streller, of Leipzig, for a process for "rendering organic and inorganic bodies transparent and translucent,"

with the aid of the principle of the refraction of light. Streller says he proceeds by saturating the body in a liquid having the same index of refraction as its own, and such a liquid, the index of refraction of which corresponds to the index of refraction of most of the animal tissues, is a mixture of three parts of salicylic methyl este and one part of benyl-benzoate. Dr. S. F. Harmer, F.R.S., from the Museum, observed that the process offered peculiar advantages for the study of the internal structure of animals. They desired to make use of it in the Museum for study purposes and for exhibiting objects. In some cases liquids might be chosen which, by virtue of their index of refraction, caused certain parts or groups of the body to disappear, so to speak, and thereby bring other parts the more prominently into view. The processes were probably capable of use for commercial purposes. The Controller said the matter was very interesting, and he would look into it.

Coke for Farm-Tractors.

Mr. C. D. Leng, of Sheffield, writing to "The Field," on the subject of farm-tractors, says that, "although shipping space is valuable, we are importing farm-tractors to run on petrol or paraffin; and there is such a scarcity of these fuels that many tractors are standing idle to-day. Also paraffin has increased in price from 4d. to 1s. per gallon. We have an English invention in the shape of a coke-fired steam chassis of great power, and weighing only 50 cwt., which, in my opinion, would be ideal for work on the land, and, with a change of wheels, on the road. This invention has been running very successfully on the streets of London in the shape of the National Steam Bus. With coke as fuel, the cost of running is equivalent to petrol at 4d. per gallon; and the maker should be encouraged by the Government to turn out chassis for farmers on a large scale, instead of making munitions on a small scale. Owing to the light weight and great power, this chassis would be most suitable for work on the land. With a two-wheeled trailer, it would carry bulky loads, such as hay and straw, on the road; and the fuel could be obtained easily and without the usual circumlocution, red tape, and delay attached to all dealings with the Petrol Control Committee. If someone connected with the Board of Agriculture will test one of these 6-ton capacity chassis, there will be no need to send orders abroad and be dependent on foreign spirit."

War Bonus for Officials—Except the Gas Manager.

At a meeting in committee of the Abergavenny Town Council, a decision was arrived at to grant a war bonus to various officials; but it was resolved that the salary of the Gas Manager (Mr. A. T. Kyle) should "remain as it is." Naturally, so apparently anomalous a state of things gave rise to some criticism when the minutes came up for adoption by the Council at an ordinary meeting. Mr. Delafield said it was well known that the Gas Manager had not made any application to have his salary altered. The resolution carried was that any increase granted should be by way of war bonus; and from this point of view the question of salary relating to the Gas Manager was out of order. With regard to declining to give a war bonus to the Gas Manager, they had dealt with every person in their employ; but they had singled out one salaried official and declined to give him a bonus, because they considered his salary was sufficient, as compared with other officials, because his salary was increased by a sliding-scale, and because of certain benefits which he received in regard to his house, gas, and coal. The Council had unknowingly cast a reflection upon a man whom they had in their wisdom appointed. They had actually censured the Council who appointed the Gas Manager, by picking him out as the only one who should not receive a war bonus. He proposed that they reconsider the question; but as there was no seconder, the proposition fell to the ground. Mr. Mansfield said the Gas Manager had done his work excellently; and he should not like the idea to go abroad that they cast any reflection on him. It was simply that his salary happened to be higher than that of the other officials.

Hull Gas-Workers' Certificates.

The Hull Tribunal reviewed the certificates of a number of the employees of the British Gas Light Company last week. Mr. Warren, who is in charge of the department responsible for taking the gas to the meters, applied for the continued exemption of three fitters, two of whom were 25 years of age and the other 27; the former being single men. The Company were responsible for the supply of gas to 50,000 houses, 4200 street lamps, 17,000 cookers, and 9000 fires. As many as 3000 complaints had been received in one week; but the greater proportion were in respect of the quality of the gas, owing to the extraction from it of the bye-products required for munitions. It took two years to train a man for this work. Mr. Harry Wray, the Solicitor representing the Company, drew attenion to the appeal issued that morning by the Minister of Munitions, urging the public to burn less coal and to use coke and coal gas for domestic purposes. This was necessary in order that valuable bye-products could be extracted from the coal for munition purposes. The certificates of all these men were withdrawn; a month's grace being recommended. The Manager of the fittings and show-room department, Mr. Perkins, applied for two married fitters—one 24 and the other 31 years of age. The latter, owing to his age, was declared to be in a certified occupation; and his exemption was continued. Mr. Perkins said his department was responsible for the cooking-stove, gas-fire, and slot installations. Of 69 men of military age in the service of the department at the outbreak of war, 55 had joined up. The military representive, Major Douglas Boyd, suggested that boys of 16 could do the work. Mr. Wray replied that people might be blown up if inexperienced youths were employed. The tribunal withdrew the certificate, and recommended a month's grace.

Gas-Mantles, Limited, was registered on the 11th inst., with a capital of £6000, in £1 shares.

MISCELLANEOUS NEWS.

BOMBAY GAS COMPANY, LIMITED.

The Ordinary Meeting of the Company was held last Thursday, at the London Offices, Moorgate Station Chambers, E.C.—Mr. H. E. JONES in the chair.

The SECRETARY (Mr. A. Dickson, jun.) read the notice convening the meeting and the report of the Auditors; and the Directors' report and the statement of accounts were taken as read.

A REDUCTION IN PRICE AND FULL DIVIDENDS.

The CHAIRMAN said it was his duty and pleasure to move the adoption of the report and accounts. In doing so, he might say that the Company were in a position that was rather unusual among gas undertakings at the present time. The Directors had reduced the price of gas within the past year by a sum equal to 4d. per 1000 c.ft., and, in addition, were recommending dividends on the full scale. This, of course, arose from their distance from the arena of the war, which was making things so difficult for most of the gas undertakings in the United Kingdom. For their own favourable condition they must be thankful. The shareholders would be interested to know that the increase in the sale of gas was, roughly, 2¾ p.ct., in spite of the war, and that 286 consumers had been added to the list, which now reached very close upon 12,000. In the report the shareholders would see a statement of the profit, which he need not repeat; and they would also remark that there were two vacancies to be filled up by the re-election of two retiring Directors.

MAINTENANCE AND REPAIRS AND THE COST OF MATERIALS.

With regard to the accounts, it would be noticed that there was more than a sufficiency for the dividend, and that, as a matter of fact, the accounts showed on their face a considerable increase of profit. It would be found that this was largely due to the reduced cost of coal, and also, on the other hand, to an improvement in the sale of residuals. Between these two points they were able to face the increased cost of labour and materials, which made some of the accounts for repairs heavier than before. He should like to explain that, though these charges were heavy in amount, because the price of materials, labour, and freights were so high, he was personally far from being satisfied with the real expenditure for maintaining the undertaking in the condition in which they usually liked to have it. It had, however, been kept up meet with the circumstances of the difficulty with materials, and getting them transported and fixed, and to pay the prices they were called upon to pay. Perhaps the shareholders would be interested to know that the price of ordinary cast-iron pipes was practically double what it was before the war, and all wrought-iron and brass goods had gone up nearly 100 p.ct. Therefore, the same amount of money would no longer do the same amount of upkeep that it would do before the war. In this relation, although they were felicitating themselves upon the handsome balance that appeared on the accounts, they must take a modified view of it, and bear in mind that there might be heavier expenses in the years to come to make up the leeway from which they were now suffering. They could not get various things out from England which were quite essential—not even such simple things as meter and stove parts, or a motor-car which was to replace one worn out by their Engineer and Manager (Mr. A. R. Burch). They had bought the car, but there it stood, owing to the difficulty of getting it transported and admitted into India. So it was obvious to everybody that the same thing must take place with this undertaking as with all others with which he was personally connected—they were slowly going back through the absence of that due expenditure on upkeep which he always told the shareholders he liked to be on a liberal scale.

OTHER INTERESTING FEATURES OF THE ACCOUNTS.

The accounts were chiefly interesting on that score, as well as upon that of the saving on the coal and better receipts for residuals, part of which was due to their being able to dispense with the carburetted water-gas plant, and employ coal alone for the manufacture of gas. Rent, rates, and taxes were higher by some £1300, having been £1810 last year. This was explained by the fact that there had been, after a long lapse of time, a reassessment of the whole undertaking; and the Directors, on carefully going into the matter, did not think it a case where further appeals would be useful or desirable. On the whole the Company were not unduly assessed in that figure. Most of the other items in the accounts showed insignificant variation. Perhaps he might point out that, although they had sold 2¾ p. ct. more gas, the rental received for private lighting was only £84, and for public lighting £647, more than it was last year—the difference being cancelled by the reduction of the price of gas. It was very near the Directors' hearts to further reduce the price of gas as occasion allowed. Perhaps he was telling secrets he ought not to tell when he said the Board were contemplating at the present time, and were hoping to have, the opportunity of making a further reduction in price. There was one other item. They usually saw a figure on the receipts side of the accounts for the sale of small fittings. This year there was a figure of even larger amount on the debit side. This was partly made up of the extra cost of such fittings as inevitably had to be put in at the Company's own cost, and partly owing to the difficulty, with constantly rising rates and freights, of revising the price list, so that the Company had not been charging the consumers the full value under the advanced rates. The wish of the Board was always to assist consumers, as was done in England through the show-rooms and fittings departments. They called their Manager's attention to this matter; and he (the Chairman) did not regard it as a serious thing if it facilitated business and helped the consumers of Bombay to a better use of gas. In this connection, it was most unfortunate they were restricted in sending things out, because they did find a very substantial tendency to increase the use of gas in various directions for the several purposes which were so common in this country. It was, therefore, unfortunate they could

not send out more goods. However, they were doing the best possible for both consumers and the Company. The 4d. reduction in the price of gas was equivalent to giving the consumers of Bombay £2500 a year. He was sure the shareholders would also heartily approve the action of the Directors in taking up £20,000 of the New War Loan. A company such as theirs, trading in a distant part of the Empire, could not do less than evince their patriotism by that small contribution. [Hear, hear.] He should have mentioned earlier in the proceedings that their able Deputy-Chairman (Mr. William Graham Bradshaw) had written to say he was confined to his bed by a chill, and so was unable to be with them that day. He asked him to apologize for his absence.

Mr. Louis Penny seconded the motion.

Mr. G. J. Stammers asked whether, so far as the Chairman could judge, the circumstances for the current year were satisfactory, and the prospect favourable for an equally good report being put before them at the next annual meeting.

The Chairman said he quite thought so, because otherwise the Directors would not be thinking, as he had told the shareholders they were doing, of a further reduction in the price of gas.

The motion was unanimously carried.

The Chairman proposed the declaration of a final dividend for the year ended Dec. 31 last of 4½ p.ct. (less income-tax at the rate of 2s. 11¼d. in the pound), making, with the interim payment of 3 p.ct., a dividend of 7½ p.ct. for the year.

Field-Marshal Sir Evelyn Wood, V.C., G.C.B., seconded the motion, which was unanimously carried.

The Chairman moved the re-election of the retiring Directors (Mr. W. G. Bradshaw and Mr. Louis Penny). He remarked that Mr. Bradshaw was away from them for the first time that day for the great number of years during which he had been a Director and the Deputy-Chairman. They knew what a distinguished position he held in the City of London as the Deputy-Chairman of the London, City, and Midland Bank, Chairman of the Commercial Gas Company, and in connection with other companies. They could not have a more valuable colleague than he constituted in his own person. Mr. Louis Penny was known to them all. He was at one time out in Bombay, and knew Bombay gas affairs from "A" to "Z." He was extremely useful to the Company as a member of the Board.

Mr. Charles Hunt seconded the motion, which was heartily agreed to.

Mr. Penny thanked the shareholders on behalf of Mr. Bradshaw and himself.

Moved by Mr. Stammers, and seconded by Mr. H. F. Hills, the Auditors (Mr. Spencer Gore Brown and Mr. Ernest Drew, F.C.A.) were reappointed at the same remuneration as before.

The Chairman proposed a vote of thanks to the officers and staff. He said the shareholders knew how well their worthy Secretary did his work. He was working under great disability. His chief clerk (Mr. Comber) had been called to the service; and their Secretary had now to rely upon the help of ladies. It was wonderful how well the women folk had come to the front in this war, and had shown a sense of devotion and patriotic feeling. With regard to the staff in India, it had been rather depleted by resignation, and so was in a short-handed condition. But the remaining members of the staff were keeping up their courage and their work in the best way. Leave of absence was due to more than one of them. But it was not felt desirable they should leave Bombay and come over here, as there might be some difficulty in getting them back again. Therefore they had to take rest and recreation, as opportunity offered, in the cooler climate of parts of India; and the Directors had urged them to take this course of recuperating themselves. With regard to the work in Bombay, it showed the greatest competence, energy, and care on the part of the technical officers, Mr. Burch and his assistant Mr. Lane, and Mr. Challice, and Mr. Woodford, the Accountant, and reflected the greatest credit on the whole of them. Their native assistants and clerks were doing their work diligently and punctually and in thorough good spirit—right down to the men who charged the retorts.

Mr. Charles Hunt seconded the motion, which was cordially passed.

The Secretary said he should like to thank the Chairman, Directors, and shareholders on behalf of the officers and staff in Bombay, as well as for the ladies and himself in the London office, for the very kind words that had been used, and the recognition made of their services. It was true they had had a somewhat anxious time, and there had been certain difficulties to meet. He was sure the vote, when communicated to those working on the other side, would be an additional encouragement to them to continue to meet the difficulties to the best of their ability.

Moved by Mr. John Mitchell, and seconded by Mr. A. J. Kingdon, a hearty vote of thanks was passed to the Chairman and Directors.

The Chairman replied; and the proceedings then terminated.

MONTE VIDEO GAS COMPANY, LIMITED.

Heavier Expenditure Counterbalanced by Increased Receipts.

The Ordinary General Meeting of the Company was held last Wednesday at Winchester House, Old Broad Street, E.C.—Mr. Charles Hunt in the chair.

The Secretary (Mr. Henry Kearns) read the notice convening the meeting; and the Directors' report and the accounts were presented.

The Chairman, in moving their adoption, said, as the shareholders would no doubt have realized, the report and accounts referred to a period which was beset with difficulties and anxieties of no ordinary kind, and of which unfortunately they had by no means seen the last. These difficulties and anxieties were chiefly connected with the shipment of coal and other materials to Monte Video, on the cost of which

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Demonstrations held daily until May 25th from 10 a.m. to 4 p.m. (Saturdays excepted).

JOHN WRIGHT & CO.,

Essex Works, BIRMINGHAM.

Wright's "Lip-Axis" Crucible Furnace.

the success of the undertaking almost entirely depended. Last year at this time they had the unpleasing duty to report that it had become necessary, owing to a great advance in the cost of freightage, to make a further substantial addition to the price of gas. But not long afterwards, freights became somewhat easier; and advantage was taken of this to fill up the Company's stores to the utmost of their capacity. It was very fortunate that they did so; for the improvement was not of long duration, and for a small quantity of coal recently shipped, the cost exceeded all previous experience since the war had commenced. All these adverse conditions were reflected in the revenue account by an increase in the total expenses of £29,173, as compared with those for the previous year, though less gas was made, and the cost of production was less, owing to the new retort-house having been in operation throughout the year. This increased expenditure was balanced on the other side of the account by improved receipts to the extent of £28,219, resulting from the higher prices charged for gas, improved receipts from residuals, and a better return from the Dock Department. Thus the trading profit was less than that of the previous year by £953, although the ultimate balance to the credit of profit and loss was greater by £1433. The net result was a sufficiency of profit to pay a dividend at the same very modest rate of 3 p.ct., less tax, with which shareholders had had to be content since the outbreak of war, and increase the amount to be carried forward to the current year's account by £1433. They would all like a larger dividend; but in these times it was something to get a dividend at all, especially having regard to the onerous conditions which bore with special hardness upon gas undertakings operating in neutral countries. Turning to the balance-sheet, it would be seen that practically the same amount had been written-off the capital account as in former years, and also that the expenditure on this account had been unusually light. The expenditure was wholly on new mains and meters; the manufacturing works being fully equal to all present requirements. It showed also that the stock of coal was valued at £23,136, which was a great increase on £8919—the amount at which it was valued the previous year. The difference was accounted for by the increase in both quantity and value. Similarly the stock of materials for use or sale, other than coal, showed an increase of £3405, chiefly due to increased stocks and values of cast-iron pipes and connections and cement. On the other hand, sundry debtors were less by £3180; and British, Colonial, and Foreign securities, by £3638, which was due to further small realizations and amount for depreciation written off, while "Other Property" was £2003 less, due to the sale of Uruguayan Treasury Bonds in Monte Video. It would also be seen that there was no item for bills receivable; while, on the other side of the account, the loan from the Bank, which figured in the previous year's balance-sheet at £17,800, had also disappeared, though whether temporarily or permanently remained to be seen. At the date, however, to which the accounts were made up, and taking into account these two items, and also cash in hand, there was an appreciable improvement in the financial position as compared with the previous year. But it must be said that this improvement was accompanied by a falling-off in the sales of gas, averaging 10·29 p.ct. for the year. This falling-off appeared to be mainly due to the financial depression which set in at the commencement of the war, and which was aggravated last year by one of the worst droughts that had ever been experienced in Uruguay. The Directors had done their best to meet the situation by reducing the price of gas by 1 c. to 9 c. per cubic metre, as soon as circumstances last autumn enabled this to be done. They thought that this had not been without effect, although, since the beginning of the present year, the decrease had been at a greater rate than last year's average. A further reduction of price would be made as soon as circumstances permitted, although it must be said that the prospect was at present by no means favourable. He need hardly say that throughout this most exceptional time the efforts of the Board had been very ably seconded by the various members of the Company's staff, by the General Manager at Monte Video, by the Secretary, and by all who acted under their directions. But he ought particularly to mention Mr. Kearns, because upon him devolved much of the responsibility of procuring and shipping all the necessary supplies of materials for Monte Video—no easy task in the best of times, but rendered infinitely more difficult under present conditions. His colleagues and himself felt they could not speak too highly of the way Mr. Kearns had fulfilled these most important duties, and of his vigilant regard for the interests of the undertaking.

Mr. FRANK H. JONES, in seconding, associated himself with the remarks of the Chairman regarding the staff and Mr. Kearns, because the Directors could not have obtained the results in the balance-sheet without their extraordinarily able and hard work.

The motion was unanimously carried.

A dividend was declared of 6s. per share, less income-tax, for the half year ended Dec. 31; making a payment of 3 p.ct. for the year.

The retiring Directors (Mr. John Mews and Mr. Charles Hunt) were re-elected; and the thanks of the shareholders were heartily accorded to the Chairman and Directors, to the General Manager (Mr. Thomas F. Lane), the Secretary, and their staffs.

Mr. KEARNS, in responding for the staff, said it would give him much pleasure to send a copy of the resolution to Mr. Lane. As to the generous terms in which the Chairman and Mr. Jones had referred to the work of the London Office, he should like to say that, without the very real and practical help the Chairman and his colleagues had at all times given him, it would have been impossible to make the rapid decisions necessary to take advantage of favourable markets.

War Bonus at Huddersfield.—The Huddersfield Town Council last week confirmed recommendations of the General Purposes Committee to grant an increased war bonus of 3s. per week, or 6d. per shift, to employees in all Corporation departments (the tramways excepted), making a total bonus of 8s. per week, or 1s. 4d. per shift. To members of the Municipal Officers' Guild (office staffs), the present bonus was increased by 5s. per week for adult males and 2s. 6d. for females and males under 21 years of age.

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BAHIA BLANCA GAS COMPANY, LTD.

Making Gas from Hard Wood and Heavy Oil.

The Tenth Ordinary Meeting of the Company was held last Thursday, at the London Offices, No. 1, East India Avenue, E.C.—Mr. J. C. im Thurn presiding.

The Secretary (Mr. W. Upton) read the notice convening the meeting; and the report and accounts were taken as read.

The Chairman, in moving their adoption, said that when they met a year ago he gave an account of the position at that time, and reported that the coal outlook was as bad as could be. In this respect, the past year was quite as anxious as had been foreseen; but fortunately they had been able to keep the business going. During the first half of the year, they were working with coal; and as the residuals sold at exceptionally high prices, there was a profit of £2146. Since Aug. 1, however, they had been working entirely on substitutes—such as native wood and oil—with the result that the second half year showed a loss of £1566, leaving a small net profit for the year in Bahia Blanca of £580. But from this had to be taken the London charges (consisting principally of interest on loans and advances) amounting to £4551, which left them for the year with a debit balance of £3971. He was pleased to say they had been, on the whole, highly successful in so managing as to maintain the business and avoid disaster to the Company. The Manager (Mr. A. M. Hunter), who was a most resourceful man, had been for some time previously experimenting in making gas from two substances which were obtainable in sufficient quantities, and which seemed promising. These consisted of a hard native wood called "Quebracho Blanco" and a thick, heavy native petroleum oil which was raised in Comodoro Rivadavia—wells situated not far from Bahia Blanca. The result of his labour had been that, since August, the Company had been sending out a gas of steady and constant heating and lighting value, comparable with that previously supplied from coal alone, which gave satisfaction to the consumers, whether used for lighting, heating, or power production. It was particularly gratifying to be able to call the attention of the shareholders to what had been done, inasmuch as he believed he was correct in saying that their successful experience in this direction was probably unique in gas manufacture. The native petroleum oil they were using was inapplicable to the plant of an ordinary gas-works; and success had been entirely due to the unremitting efforts of Mr. Hunter in developing quite new methods of successfully using oil in the only plant at his disposal—the ordinary coal-gas retorts. These had been adapted with material made on the spot, and in their own works, to the new methods of gas making.* There had, however, been an increase in the cost of manufacture. Mr. Hunter had reported that, with some modification of the plant, much better and more economical results should be obtained; and he was also of opinion that, if only the native oil were to be had at anything like pre-war prices, it might even be found advantageous to do without coal permanently. One of the chief difficulties which confronted the Company was that caused by lack of prosperity and development of Bahia Blanca. Had the rate of expansion of the city not been arrested, the works would have been called upon to their full capacity. The Company never possessed working capital; and in order to provide the various sums which were yearly added to capital account, chiefly for mains and services, and to carry on the business generally, it became necessary from time to time to raise money by way of loans and advances in London. When the war broke out in 1914, these advances amounted to £43,428; and to the end of 1916 various sums in cash had been advanced by the Directors in order to keep the business going, which together made a total of £45,749 now shown in the accounts. Since then additional sums had been advanced to the extent of £2233; and as the borrowing powers of the Company were exhausted, the time had arrived when the shareholders themselves must take up a part of this burden. Undoubtedly, a question every shareholder would be asking himself was whether it was worth his putting up money to conserve his interest. It should be worth while to make some effort. After all, most of their troubles are due to the effects of the war, which must surely come to an end some day, and possibly before very long. The Company at some convenient date would have to be reconstructed; but while the war continued this was impossible. The most favourable course, in the opinion of the Board, would be for the shareholders to provide sufficient funds to carry on the business for a period of (say) one year, when it was hoped the conditions might be more favourable. If the Board were not supported to a sufficient extent by the shareholders, some other solution of the difficulty would have to be sought, which might prejudice their interests much more drastically. As to the future, they must look forward to obtaining either cheap coal or cheaper oil before they might expect any great improvement. Bahia Blanca was most excellently situated as an outlet for the great grain growing districts of the southern part of the Republic; and if the late succession of unfavourable harvests should have now come to an end, they might with a certain measure of confidence look forward to a series of good harvests. It seemed to him that the shareholders would be very ill-advised not to support the Board in their recommendations. The Directors must be in a position at the latest by the end of this month to know what measure of support they could rely upon, in order to continue the business of the Company as at present.

After some discussion, the report was unanimously adopted,

* Some particulars of what has been done will be found in the "Journal" for Sept. 19 last, p. 555.—Ed. "G.J."

On April 1 last, there were on military service 201 employees of Messrs. Brotherton & Co., Ltd., whose headquarters are at Leeds. The names and regiments of those who have thus responded to the call have been printed in a neat booklet, which places on permanent record the manner in which they have served and are serving their King and country.

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MANCHESTER. NOTTINGHAM.

RATE RELIEF AND GAS PRICES AT MANCHESTER.

Dealing with the year's estimates, the Finance Committee of the Manchester Corporation state that the Gas Committee's proposed contribution is £9112, as against £50,000 contributed last year. The results for the past year are much better than was anticipated. A deficiency of £79,752 was estimated; but, from the approximate results, it will be only £24,407, or £55,345 less, brought about by increased total receipts of £29,950 more than accounted for by higher income from residual products, and reduced expenditure of £25,395, principally under the items of coal and oil, and rents, rates, and taxes. The deficiency at the commencement of the year proved to be £7009 less than the approximate results indicated; so that at the end of the year, instead of an accumulated deficiency of £120,770, the amount is £58,416 only, which is brought forward to the debit of 1917-18. For the current year, the estimates are framed upon the basis of an increased price of 6d. per 1000 c.ft. of gas, to come into force as from the 24th prox. The total income, including three quarters at the increased price, is estimated at £1,118,000; being £114,250 more than the actual income for last year. The estimated expenditure, including debit charges and provision for renewals, amounts to £1,065,558, or an increase of £87,401 over last year's actual expenditure, £59,823 of which is on the item of coal and oil. The surplus for the year is estimated at £52,442, of which it is proposed to contribute £9112 in aid of the rates and apply the balance (£43,330) towards reducing the deficiency brought forward (£58,416), which is estimated as £15,086 at the end of the year.

Reporting upon the proposal to increase the price of gas, the Finance Committee remark that the usual discount of 2d. per 1000 c.ft. for payment within one month will be allowed from the revised scale of prices. The estimated additional income for the current year is £120,000. This step has become necessary principally on account of the increase in the price of oil consequent upon the war. In the ordinary course, the proposal would entail a considerable charge on the city fund in respect of street lighting; but owing to the restriction of lighting, this effect is nullified. In respect of other charges on the city fund, it is estimated that the increase will amount to £3000. The Committee point out that the accumulated deficit at March 31 last is estimated at £58,416; and the year's income (on present prices) is estimated by the Gas Committee to be insufficient to meet the year's expenditure (excluding any contribution in aid of rates) by the sum of £67,558, thereby increasing the total deficiency to £125,974. It will be seen, therefore, that it is necessary to raise the price at once; and the Committee agree with the proposal to increase it 6d. per 1000 c.ft.

The Selby Urban District Council on Wednesday last accepted a recommendation of the Gas Committee that the men at the gas-works be paid an additional 4d. per day and war bonus.

NOTTINGHAM GAS REVENUE.

Although the amount falls short by £5000 of that contributed from the same source in each of the immediately preceding annual periods, the Nottingham Corporation were not slow at their meeting yesterday (Monday) week, to evince their appreciation of the excellent management which has enabled the Gas Committee this year to allocate from the profits £30,000, in relief of the district rate. Faced by an increased expenditure of £53,000 yearly, entailed by the grant of war bonuses in most departments of the municipal service, the Council had no alternative but to increase the district rate by 6d. in the pound. What the entire absence of the Gas Committee's help would have meant in the present state of the municipal finances may best be realized from the fact that a rate of 1d. in the pound upon the present assessable value of the city will only produce £4745. The oldest branch of the municipal trading therefore contributes, as in previous years, the lion's share of the relief—the whole of the remaining undertakings adding only £17,505 to the total available in relief of the rates, amounting on this occasion to £47,505, compared with £64,515 last year.

Incidentally, it was mentioned by the Chairman of the Finance Committee that over £9000 was saved upon public lighting during last year; only £2200 having been spent, compared with an estimated outlay of £11,500.

CONSUMPTION OF ARTIFICIAL GAS IN AMERICA.

An advance report of the United States Geological Survey deals with the production and consumption over the last eighteen years of artificial gas as produced by retorts, cupolas, or coke-ovens—producer and blast-furnace gases, acetylene, &c., being excluded. The total consumption of gas as thus defined has increased from 50,000,000,000 c.ft. in 1898, to 150,000,000,000 c.ft. in 1907, and to 260,000,000,000 c.ft. in 1915. Of the increase of 210,000,000,000 c.ft. in eighteen years, only 25,000,000,000 c.ft. is due to coal retort gas, 105,000,000,000 c.ft. being oil and water gas, and 80,000,000,000 c.ft. surplus from coke-ovens. The greater increase during the last seven years is more than accounted for by the quantity of surplus gas from coke-ovens that is being utilized for town supply. This is now more than double the total make of coal retort gas; and, if this is excluded, the increase in the consumption of coal and water gas has been notably lower since 1907 than during the ten years preceding.

Further examination of the figures reveals a rapid increase in the use of gas as fuel, but a decline in the demand for lighting. The consumption per head of the population supplied, excluding coke-oven gas, shows a steady advance from 676 c.ft. in 1898 to 1580 c.ft. in 1908. The figure for 1915 is 1809 c.ft. There is a marked sympathy between selling price and consumption. The selling price fell steadily from an

average of $1·17 per 1000 c.ft. in 1898 to 93 c. in 1912. Since that date it has shown but a trifling reduction. The sale per head is largest in the more closely populated districts, probably because the price is also lowest. At rates above $1 per 1000 c.ft. the increase is slow; between $1 and 90 c., it is more pronounced; and it is highest at figures below 90 c.

ECONOMY OF GAS COKE AS FUEL.

The Deptford Borough Council during March of last year introduced the London Coke Committee's apparatus for burning gas coke in the steam-boilers at the public baths; and they now report the following result of a year's working with coke exclusively as fuel.

The cost of coal for twelve months from March, 1915, to March, 1916, at the current price of coal, would have been £1792. The cost of gas-coke from March, 1916, to March, 1917, has been £1444. The amount saved, therefore, was £348. This saving, which is equivalent to 19·4 p. ct, would have been greater but for the large increase in the heating and electric lighting of the buildings, owing to the very cold and dark winter, and to the increase in the number of warm baths used, estimated at over 9 p. ct. The financial saving, despite all the adverse circumstances, has exceeded the estimate made by the local gas company who supplied the coke-burning apparatus, which was fitted to the boiler furnaces by the baths' staff at a total cost of about one-tenth of the saving effected during the first year.

From the national standpoint, our correspondent points out, the saving effected by the patriotic action of the Council in using gas coke in lieu of raw coal is in the bye-products recovered by first treating the coal in gas-retorts. The bye-products that are recovered from an equivalent quantity of coal so treated include: 1440 gallons of benzol, 9600 gallons of coal tar, and 10 tons of sulphate of ammonia.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *May* 21.

There is a continued demand for pitch for shipment, and the price is firm at about 37s. per ton net, in bulk, at makers' works. There is good inquiry for dehydrated tar for road work and other purposes. Ordinary London creosote is steady at the figure last recorded. Other products generally remain unchanged.

In sulphate of ammonia, orders continue to be placed for agricultural purposes at the official figures.

Tar Products in the Provinces.

May 21.

Markets for tar products remain about the same, and there is no alteration in values.

The average values for gas-works products during the week were: Gas-works coal tar, 20s. 3d. to 24s. 3d. Pitch, East Coast, 16s. 6d. to 17s. 6d. per ton; West Coast—Manchester 15s. 6d. to 16s., Liverpool 16s. 6d. to 17s., Clyde 17s. to 18s. Benzol, 90 p.ct., North, 10½d. to 11½d.; 50-90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 3¼d. to 3⅜d. Heavy oils, in bulk, North, 3⅜d. to 4d. Carbolic acid, 60 p.ct., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 80s., bags included. Anthracene, "A" quality, 3d. per unit; "B" quality, 1¼d. to 2d.

Sulphate of Ammonia in the Provinces.

Liverpool, *May* 19.

There is no new feature in the position to comment upon. The Government still refuse to grant export licences; and the values for fertilizing purposes in the United Kingdom remains at £15 10s. per ton to mixers and distributors, and £16 direct to farmers, net cash, in makers' bags, carriage paid to receivers' stations.

Nitrate of Soda.

Owing to the continued scarcity of supplies the spot market has hardened further, and holders now require 25s. 9d. per cwt. for ordinary quality and 26s. 3d. for refined.

Public Lighting Suspended at Plymouth.—It was decided by the Plymouth Town Council last week that the lighting of the street-lamps should be discontinued until the end of August. The Watch Committee had resolved that the lamps should not be lighted from May 11 to Sept. 30; but Mr. Eyre (the Chairman of the Electricity and Street Lighting Committee) said it was found last September that there were many complaints about the darkness of the streets in that month, and it was considered desirable to begin the lighting a month earlier. The cost of lighting for the month would be only £111.

Welsbach Light Company of Australasia, Ltd.—Last week, the Welsbach Light Company of Australasia unsuccessfully petitioned the Judicial Committee of the Privy Council for leave to appeal from a judgment of the High Court of Australia in an action against the Commonwealth of Australia. It was explained that under the Trading with the Enemy Act the Attorney-General for Australia made a declaration that the Company was, in his opinion, "managed or controlled, directly or indirectly, by or under the influence, or carried on wholly or mainly for the benefit, of persons of enemy nationality or resident in an enemy country. The Company's affairs being thus brought to a standstill, they brought the action, alleging that the provisions of the Act were *ultra vires*, and in any case that the declaration was unlawful. They denied the allegations as to enemy influence or control. The Commonwealth demurred to the action; and judgment was entered for them.

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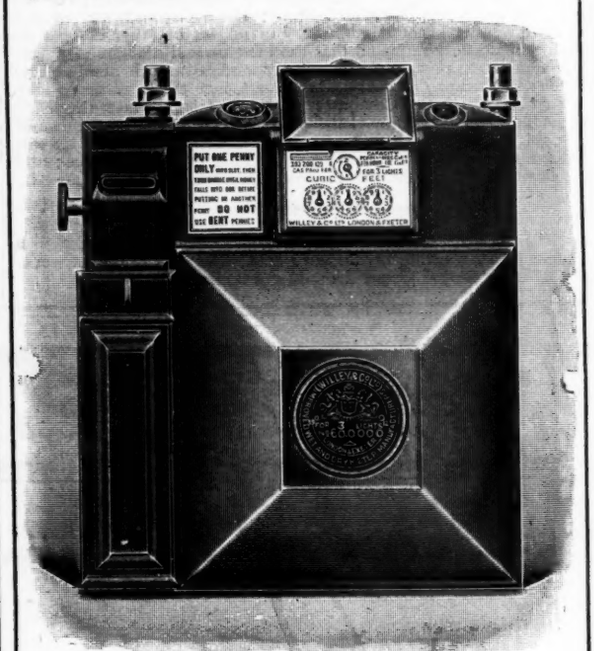

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COAL TRADE REPORT.

Northern Coal Trade.

There is rather more activity in the coal trade of the North-East, and prices are generally steady, though the lack of ready steamships is still felt. The home demand continues full, and there is a good inquiry for some of the ports of our Allies. Best Northumbrian steams are steady at 30s. per ton f.o.b.; second-class qualities are quoted at from 22s. to 23s.; smalls are easy at from 16s. to 19s., with a plentiful supply. In the gas coal trade, the demand is full at present, and there is a desire to add to stocks, more especially after the warning just given as to the probable difficulties of transport later in the year. Best Durham gas coals are firmer at 26s. per ton f.o.b.; for second-class descriptions the quotation is from 17s. to 18s. 6d.; for "Wear Specials" 28s. 6d. to 29s. 6d. is quoted. Where ready tonnage is available, however, these prices may in some instances be discounted a trifle. Little seems to have been decided as to the large contracts for gas coal that are now in the market; but for those for export, current prices are likely to be near the figures that will be settled on. Freights paid for sea carriage of gas coal in the last few days have included 20s., Tyne to London. Good gas coke is from 31s. 6d. to 32s. 6d. per ton f.o.b. in the River Tyne. It is possible that an attempt may be made to obtain a reduction of high freights on coke; but at present 45s., Tyne to Dunkirk or Havre, represents the rate.

Dublin Gas Workers.—Last week, Mr. Forbes Lancaster, K.C., on behalf of the Board of Trade, held an arbitration in Dublin into the claims for the labourers employed by the Alliance and Dublin Consumers' Gas Company for an increase of wages. The total number of applicants was 150; and they sought an increase of 5s. per week when the wages did not exceed 27s. 6d., including war bonus, to come into operation as from April 27. In the case of casual labourers, they sought 6s. per day; it being alleged that the amount paid them was somewhat less than was paid for this particular class of labour in the district. Mr. Lancaster said his decision would be intimated in due course.

Kilmarnock Gas and Electricity Supply.—Mr. Charles Fairweather, who is Joint Engineer and Manager to the Kilmarnock Corporation Gas Department, is also superintending the electrical works of the town. At present he is engaged, along with his father, in developing the business of the gas undertaking, and is at the same time extending the central generating station of the Corporation. Mr. Fairweather was active in the creation of the new works at Riverbank, where all the gas supplied to Kilmarnock is manufactured—a portion being pumped to the holders on the old site, now only used as a distributing centre. He also simultaneously carried out the erection of the buildings forming the central generating station of the town electricity works. The capital outlay on these two schemes totalled £140,000. Mr. Charles Fairweather, before settling at Kilmarnock, was four years Second Engineer of the gas and electricity works at Lima, Peru.

STOCK MARKET REPORT.

THE Stock Exchange has had a rather humdrum sort of week, with no strongly moving factors of influence so far as markets were concerned. But several topics of prime importance were prominently before the public eye. At home, there was our financial position, with its enormous and growing commitments; and then the question of the organization of trade and commerce after the war and the extinction of our old haphazard muddling ways of the past. The food problem and the strikes problem were other weighty matters. Abroad, the gradual clearing of the mists on the Russian political horizon came as a measure of relief.

However, markets which had opened rather dull and idle, became more cheerful and alive about mid week, and closed firmer generally. The gilt-edged department were rather variable. The War-Loan was steady; but some other Government issues were not at their best. Home Rails could scarcely be expected to be cheerful with labour unrest in the air. Americans were not remarkable. South Africans were steadily supported. The Foreign Market was subject to some oscillation. The first two days went heavily, Russians especially having a big drop. Then came a rebound, and the rest of the week was firm, notably French, Russian, Brazilian, and Chinese. In Miscellaneous, Rubber and Oil had ups and downs; but Shipping, Textiles, and Munitions did well.

Business in the Gas Market showed much more animation, and several issues had bargains marked in them which do not often make their appearance in the list of transactions. There were not many changes in quotations; but they were irregular. The Metropolitan Companies, Gas Light and Coke and South Metropolitan, were quite firm, and the former especially active; but among the Suburban and Provincial group were some movements in the other direction, the reasons for which are more obscure. In the Money Market, ease continued to rule all through the week.

Bargains done for cash during the week were as follows: On Monday, British 33, Cape Town debentures 62, 62½, Gas Light ordinary 72½, 72¾, 73½, ditto maximum 56⅞, ditto preference 72½, 72⅝, Malta and Mediterranean 3 15/16, 4, Primitiva preference 65s., 65s. 7½d., South Metropolitan 77½, 78, 78½, ditto debenture 56⅜, 56⅝. On Tuesday, Cape Town debenture 60, 60¼, 60½, Gas Light ordinary 72⅝, 73½, ditto preference 72½, 73, ditto debenture 57, 57⅛, Hastings and St. Leonards 5 p.ct. 71½, 72, ditto 3½ p.ct. 51, 51½, Ilford debenture 69, 69½, 70, Imperial Continental 79, 80½, Metropolitan of Melbourne 97, 97½, 97⅞, Primitiva 41s. 3d., ditto preference 63s. 9d., South Metropolitan 78, Wandsworth 4 p.ct. debenture 69½, 70. On Wednesday, Cape Town 2, ditto debenture 60, 60⅛, European 12, Gas Light ordinary 72¾, 73, 73⅛, 73⅜, ditto preference 73, ditto debenture 57, 57⅛, Imperial Continental 79½, 79⅝, Primitiva 40s., ditto preference 61s. 3d., 62s. 6d. On Thursday, British 33, Continental Union preference 61, Gas Light ordinary 72¾, 73⅛, 73⅛, 73⅜, 73¾, ditto maximum 56¾, 57⅛, Imperial Continental 79½, Lea Bridge 85, 85⅛, Primitiva debenture 57, South Metropolitan 77½. On Friday, Brentford "A" 81, 82, 82½, British 33⅛, 33⅜, 33½, Gas Light ordinary 73, 73⅛, 73⅜, ditto debenture 56½, Primitiva debenture 57½.

The Bank rate is 5 p.ct., as fixed on April 5.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div or Dividend and Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	58—63	..
1,551,868	,,	April 8	2½	5⅛%	Alliance & Dublin Ord.	59—64	60—62	..
874,000	,,	July 10	4	4%	Do. 4 p.c. Deb.	76—79	58—63	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	5⅞—6⅞	5—5½	..
50,000	10	Feb. 26	16	15/-	Bourne-mouth Gas and Water { 10 p.c. B 7 p.c. Pref. 6 p.c. 4 p.c. Deb.	29—30	24—26	..
383,110	10	,,	7	7/-		15—15½	10⅞—11¼	..
115,000	10	,,	6	6/-		13½—14	9¼—9⅝	..
159,740	—	—	—	4%		..	71—73	..
992,045	Stk.	Feb. 26	14	55/-	Brentford A Consolid.	261—266	81—84	81—82½
784,920	,,	,,	11	53/9	Do. B New	204—209	80—83	..
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	83—86	..
221,400	,,	June 11	4	4%	Do. 4 p.c. Deb.	91—93	67—69	..
217,380	,,	Feb. 26	11	10%	Brighton & Hove Orig.	208—213	150—155	..
244,200	,,	,,	8	7%	Do. A Ord. Stk.	154—159	102—107	..
530,000	20	Mar. 26	12½	22/6	British	44—45	33—34	33—33½
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	66—68	..
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	57—60	..
100,000	10	—	—	—	CapeTown & Dis., Ltd.	1½—2½	1⅞—2⅛	2
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	5⅛—5¾	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—63	60—62½
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	79½—80½	..
1,513,280	,,	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	72—74	..
560 000	,,	,,	5½	46/8	Do. 3½ p.c. do.	103—105	65—68	..
475,000	,,	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	52—54	..
800,000	,,	,,	4	—	Continental Union Ltd.	76—79	88—10	..
200,000	,,	,,	7	11½%	Do. 7 p.c. Pref.	115—118	59—61	61
278,400	—	—	—	10%	Croydon B and C 7 p.c.	..	170—180	..
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5⅛%	Derby Con. Stk.	123—125	95—100	..
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	7/6	European, Ltd.	17½—18	12—13	12
16,313,430	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb. 10 p.c. Bonds	98—102	72—74	72½—73½
2,600,000	,,	,,	3½	3½%		76—79	56—58	56⅜—57½
4,062,235	,,	,,	4	4%		96—99	72—74	72½—73
4,674,850	,,	June 11	3	3%		72½—74½	56—58	56½—57½
130,000	,,	,,	10	10%		..	..	..
258,740	,,	Mar. 12	5	4½%	Hastings & St. L. 3½ p.c.	87—89	50—55	51—51½
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16½	8—9	..
66,600	—	—	—	9½%	Hornsey 7 p.c.	..	120—130	..
131,000	Stk.	Mar. 12	7½	7⅛%	Ilford A and C.	151—154	102—107	..
65,780	,,	,,	6⅜	5⅛%	Do. B	115—118	80—85	..
65,500	,,	June 26	4	4%	Do. 4 p.c. Deb.	92—94	68—71	69—70
4,910,000	,,	May 14	9	4½%	Imperial Continental	150—160	79—84	79—80½
1,235,000	,,	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	62—65	..
235,242	,,	Mar. 12	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	85—90	85—85½
2,498,905	,,	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A B	211—213 146—148	82—84	..
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	72—74	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4⅛—4⅜	3¾—4⅛	3⅞—4
250,000	100	April 1	4½	4½%	Met. of Melbourne 4½ p.c. Deb.	90—101	88—98	97—97½
541,920	20	May 28	4	6/-	Monte Video, Ltd.	11½—12	8⅜—8⅞	..
1,875,892	Stk.	July 29	4½	4½%	Newcastle&Gatsh'dCon.	98½—99½	70—70½	..
529,705	,,	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	73—75	..
55,940	10	Feb. 26	7/14/0	7%	North Middlesex 7 p.c.	14—15	10—11	..
300,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	104—106*	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7⅛—7⅞	2—3	..
60,000	50	Feb. 26	13	12%	Portsea, Island B	128—131	92—97	..
100,000	50	,,	12	11%	Do. C	118—121	85—90	..
52,000	50	,,	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	2—2½	40/—41/3
499,960	5	June 26	5	2/6	Do. 5 p.c. Pref.	4½—5	3—3½	61/3—65/7½
521,600	100	June 2	4	4%	Do. 4 p.c. Deb.	91—93	78—80	57—57½
—	—	—	—	4%	Do. ,, ,, 1911	..	..	..
346,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	61—67	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	10½—11	7⅜—8½	..
125,000	50	July 1	5	5%		47—49	42—44	..
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	175—180	..
209,984	,,	,,	10	10%	Do. B	222—224	175—180	..
523,500	,,	,,	10	10%	Do. C	220—222	175—180	..
90,000	10	May 28	9	6/-	South African.	10½—11½	..	..
6,609,895	Stk.	Feb. 10	5/4/0	46/8	South Met. 4 p.c. Ord.	111—113	77—79	77½—78½
1,895,445	,,	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	56—58	..
224,820	,,	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	140—142	..
952,795	,,	,,	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	76—78	..
60,000	,,	,,	5	5%	Do. 5 p.c. Pref.	110—112	77—79	..
135,000	—	—	—	48/4	Do. West Kent	..	..	..
187,558	Stk.	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	88—90	..
647,740	,,	May 14	5	5%	Southampton Ord.	99—102	76—78*	..
120,000	,,	Feb. 12	7½	7⅛%	Tottenham District { A 5 p.c. B 3½ p.c. 4 p.c. Deb.	135—138	95—100	..
782,275	,,	,,	6	5⅝%		115—117	68—73	..
181.255	,,	June 26	4	4%		87—89	65—67	..
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
236,476	Stk.	Mar. 12	5	5%	Tynemouth 5 p.c. max.	108½—109½	89—91	..
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 26	8⅜	80/-	Wandsworth A 5 p.c.	151—156	114—119	..
255,636	,,	,,	6½	65/-	Do. B 3½ p.c.	129—134	99—101	..
108,075	,,	,,	5/17/3	56/-	Do. C 3½ p.c.	110—115	86—91	..
352,000	,,	,,	6½	58/9	Wimbledon 5 p.c.	117—122	88—93	..
98,000	,,	,,	6⅜	65/-	Epsom 5 p.c.	131—126	96—101	..
88,416	,,	June 26	3	3%	3 p.c. Deb. Stk.	66—69	51—54	..

* Ex. Div.

Swansea Public Lighting Dispute.—This matter [already several times referred to in our pages] has now been, it is to be hoped, satisfactorily adjusted. The Swansea Gas Company, it may be remembered, claimed against the Corporation for £2770 in respect of the maintenance and lighting of the public lamps, the majority of which had not been used for some time. A settlement has been arrived at upon the following terms: (1) The sum of £638 is to be paid to the Company in discharge of their claim under an agreement dated Oct. 1, 1890, up to and including March 31 last. (2) A sum calculated at the rate of 1s. per annum is to be paid to the Company in respect of each unlighted lamp until such lamps are re-lighted by agreement between the parties or until the termination of the war, or until notice is given by the Corporation that any lamps are no longer required to be lighted by gas, whichever event shall first happen.

Lighting Contract Claims.—At the last meeting of the Northam District Council, it was reported that the Appledore Gas Company claimed £116 and the Westward Ho Gas Company £147 under their lighting contracts; but the former Company were willing to accept £100 in settlement. Mr. P. K. Harris said the Appledore Company spent over £110 on a new main to extend the lighting, but had not been allowed to light the extra lamps, and had no return on the outlay. Last year the Company lost £300; and in the past quarter there was a further loss. Mr. Galsworthy thought the Council ought to help the Company in difficulties for which they were not responsible, and consider the inconvenience which would result if the concern were wound up. The Chairman (Mr. W. T. Charlesworth) remarked that the difficulty was that, if they allowed the claim now, they might be faced with a similar appeal later on. It was decided to pay the Appledore Company £100, and to offer a similar amount to the Westward Ho Company.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for May 16.]

Nos. 6451—6807.

Bennis, A. W.—"Gas-producers, &c." No. 6645.

Brayshaw, E. R. and S. N.—"Gas-burners for metallurgical, &c., furnaces." No. 6567.

Cayrol, J.—"Incandescent burners." No. 6619.

Dawson, H. M.—"Utilization of nitre cake in combination with sulphuric acid for absorption of ammonia and isolation of ammonium sulphate and Glauber's salt from resulting aqueous liquors." No. 6767.

Deguide, C.—"Apparatus for provoking intimate contact between gases or/and liquids." No. 6545.

Foster, J.—"Dry gas-meters." Nos. 6706, 6711.

Hardy, E. J., and Hardy & Co.—"Universal joints." No. 6673.

Harvey, E. W.—"Mechanical feeders for gas-producers, furnaces, &c." No. 6626.

Marbais, D.—See Deguide.—No. 6545.

Moffat, D.—"Gas-producers." No. 6485.

Scott, C. H.—"Gas cooking-stoves." No. 6764.

Selas-Turner Company and Turner, E.—"Burners for pressure, gas lighting and heating systems using a self-burning mixture." No. 6635.

Wright, E. N.—See Harvey. No. 6626.

Yates, H. J.—See Brayshaw. No. 6567.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

Gas Engineer and Manager. Motherwell Corporation. Applications by June 1.
Engineer, Manager, and Secretary. Northallerton Gas Company. Applications by June 8.
Engineer and Manager. Sidmouth Gas-Works. Applications by June 16.
Working Manager. Wigton Gas-Works. Applications by May 30.
Man for Dehydrating and Toluol Plant. Aylesbury Gas-Works.
Retort Setters. West's Gas Improvement Company, Manchester.

Plant, &c. (Second Hand) for Sale.

Lamps, Parts, Mantles. Glassware, Tools, &c. By Auction at 26, Chapter Street, Westminster. June 5. Particulars of Fuller, Horsey, & Co., 11, Billiter Square, E.C. 3.
Photometric Equipment. Z. L. 669, care of Deacons.

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Gasholder. No. 6308.
Purifiers. Josiah Hardman, Limited, Milton, Stoke-on-Trent.

Gas-Works for Sale.

No. 6305.

TENDERS FOR

Coal.

Ellesmere Port and Whitby Urban District Council. Tenders by May 29.
Oswaldtwistle District Council. Tenders by May 31.
Penrith Gas Undertaking. Tenders by June 2.
Rochdale Gas Department. Tenders by May 30.
Tiverton Town Council. Tenders by June 2.

Tar and Liquor.

Rhyl Urban District Council. Tenders by June 4.

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